

# Design Engineering

FIVE DOLLARS A YEAR

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May 1960

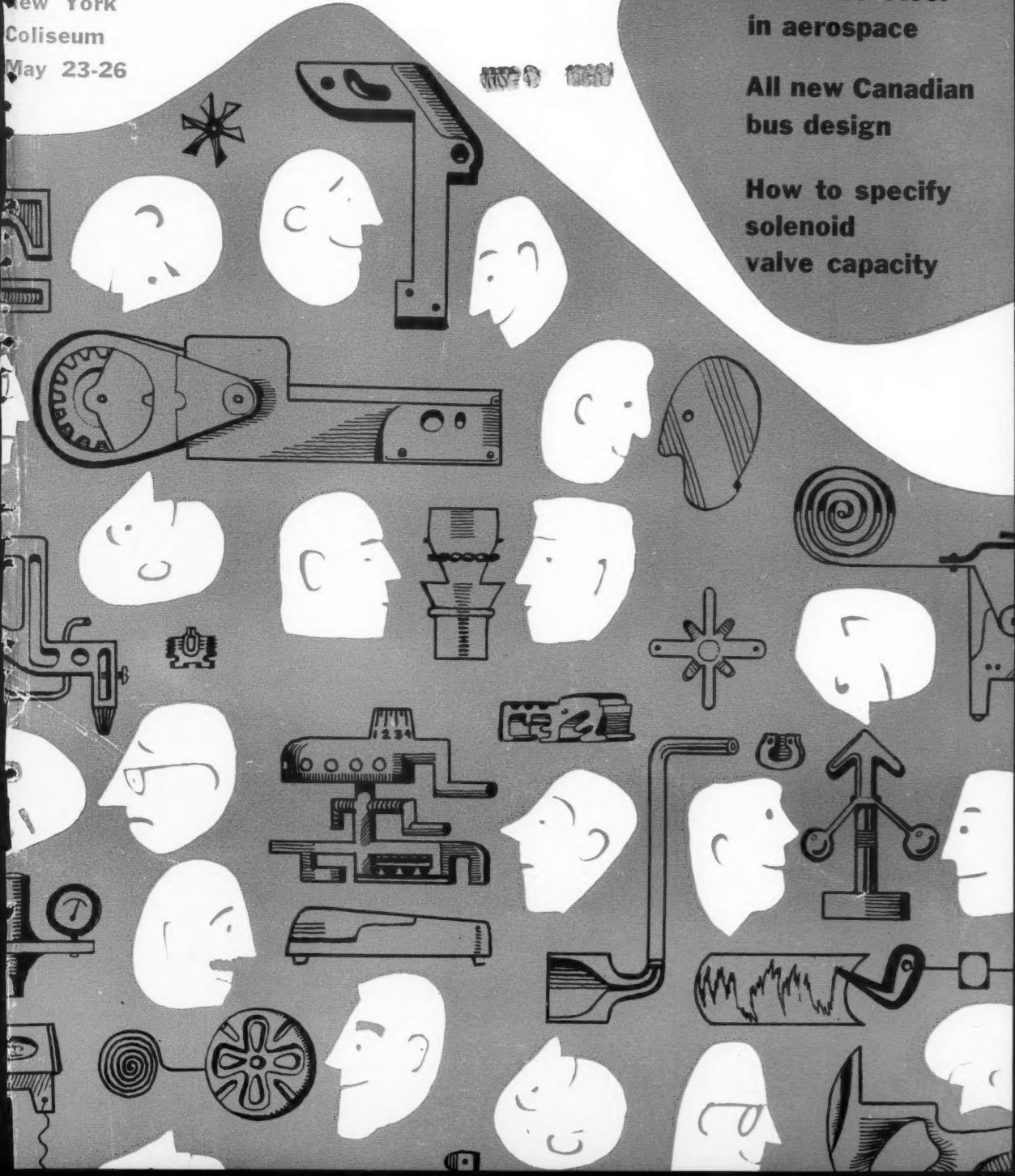
## Show Preview

### Design Engineering Show

New York

Coliseum

May 23-26



**Stainless steel  
in aerospace**

**All new Canadian  
bus design**

**How to specify  
solenoid  
valve capacity**

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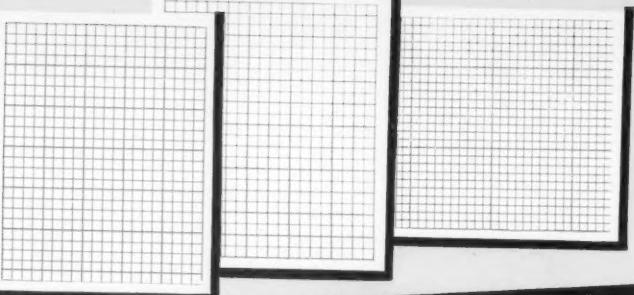
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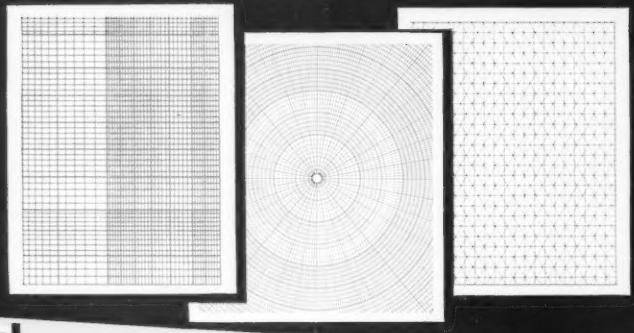
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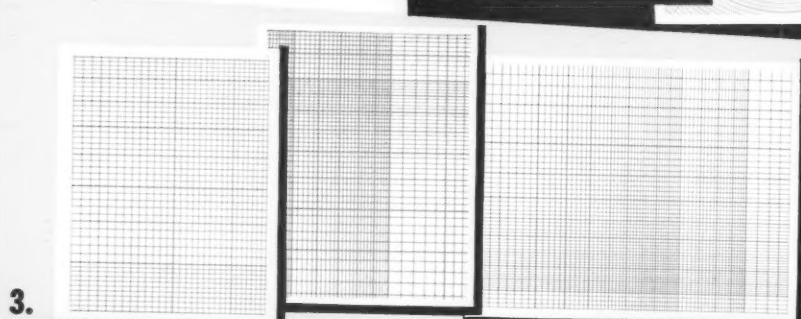
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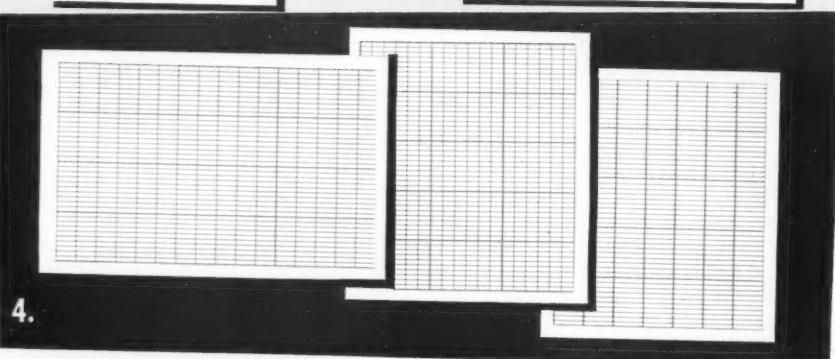
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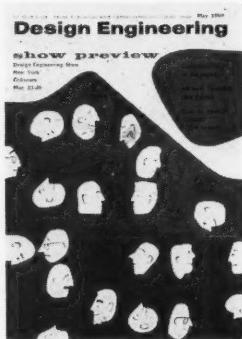
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## This month's cover

"Heigh-ho! come to the fair" our cover seems to be saying this month . . . and that's exactly what it was intended to do. Art Director Frank Davies has obviously captured the wild abandon of the viewers and the great variety of items to be seen. And if you think you do not recognize some of the items depicted, you are quite right—they will be unveiled at the Design Engineering Show. We are happy to preview the show for you in this issue.

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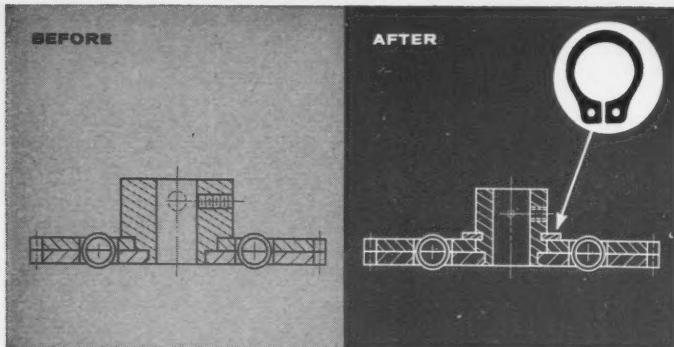
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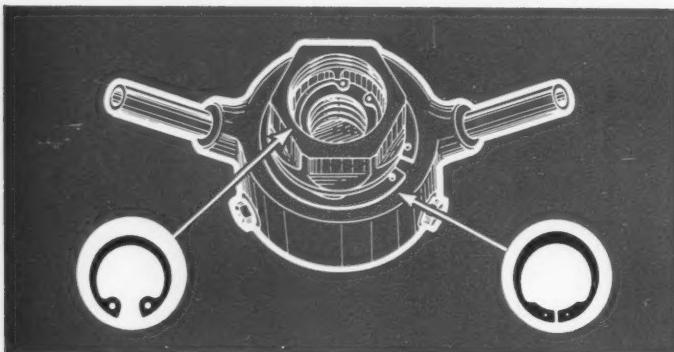
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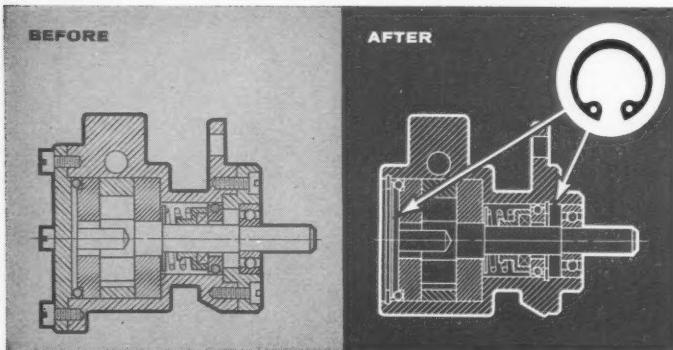
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**Gear assembly improved.** A Waldes Truarc Series 5100 retaining ring in this anti-backlash gear assembly eliminates machining and staking operations, reduces hub size, and allows easy disassembly, after gears are cut as a unit, for faster, better deburring. Typical savings: \$350.00 per 1000 units.



**Threaded retainers eliminated.** In this self-sealing coupling, costly internal and external threaded retainers were eliminated by easy-to-apply internal (Series 5000) and external (Series 5108) Truarc retaining rings. Savings per unit amounted to \$4.02.



**End-cover design simplified.** In this general-purpose pump, two Waldes Truarc, Series 5000, internal retaining rings make possible the elimination of two cover-plate castings (plus machining) and eight screws (plus drilling and tapping). Weight and dimensions are reduced and assembly and disassembly are greatly facilitated. Typical cost savings: \$1.48 per unit.

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## Designing for axial assembly with Truarc retaining rings

eliminates parts, machining, speeds assembly, simplifies maintenance

The proper application of retaining rings on or in axial assemblies can often effect startling simplifications and economies in design when compared to corresponding designs with conventional fastening devices. A few typical examples, using basic types of retaining rings, are shown in the accompanying drawings.

Threading, tapping, drilling, facing and other costly, time-consuming operations can be eliminated. Retaining rings are already in wide use in a tremendous variety of equipment ranging from household products to high-precision military gear designed for use under the most severe environmental conditions. They are quickly and simply installed in easily cut grooves which can often be machined simultaneously with other operations. The rings can frequently replace bulkier, more costly fastening devices—such as nuts, screws, studs, threaded sleeves and retainers, cotter pins, set collars, rivets and machined shoulders.

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Although the ring types shown here are basic, Truarc retaining rings come in 50 functionally different types, as many as 97 different sizes within a type, 6 metal specifications and 13 finishes. You'll find detailed descriptions of Truarc retaining rings and assembly tools, plus more than 70 typical applications in the new 24-page catalogue RR10-58. Write for your copy today. Available in Canada from:

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## Design Engineering

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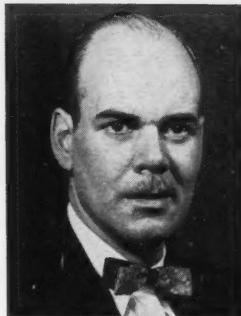
## The contributors

### From trouble to tranquility

A man who hails from one of the world's current trouble spots bows in on the masthead this month. George Harry, the new assistant editor, was born and raised in Cape Town, a lovely city presently torn by violence and race hatred.

George has been in the business paper field since his discharge from the South African Army in 1945. He has worked in Cape Town, Johannesburg and Southern Rhodesia, where he met his wife in 1950. He has travelled extensively in Africa, including the Congo, Kenya, Tanganyika and Zanzibar, which he describes as a lotus eater's paradise. He came to this country in 1953 and learned his Canadian geography at the Canadian Manufacturers' Association, where he worked for six years as assistant editor of Industrial Canada. His son and two daughters were all born in this country. Beside his family, George's principal interest away from his desk is movie photography.

His appointment to the staff of DE doesn't necessarily indicate that editor Doug Kaili is "wild about Harry," but it does mean that now he will "let George do it." Incidentally George explains that his unusual family name is as familiar in Cornwall as Jones is in Wales, O'Brien is in Eire and Smith is anywhere.



Johnson



Harry

dian manufacturers of equipment to find export markets. He is quite active in the Department's sponsored trade fairs which serve as an excellent vehicle for export trade promotion. The annual Design Show is a good example.

Johnny has one daughter and two sons—but we feel certain they are three Canadian products he will not be promoting outside the country.

### South of the border

An American cousin did our article on "How to specify solenoid valve capacity". Born George F. Kelly some forty-two years ago, he graduated from Stevens Institute of Technology in 1939. Since that time he has had a rather varied career in the field of engineering design, working for such famous names as American Machine & Foundry, Massachusetts Institute of Technology, M. W. Kellogg, and Camloc Corporation. He is presently Project Engineer of Valcor Engineering Corporation, and a member of the American Society of Mechanical Engineers.



**Nature's Tiny Flashlight.** There's more to the surprisingly bright flashes of the firefly (Lampyridae) than the body chemicals which it burns. In addition, a clear, curved section of the insect's skin acts as a magnifying lens and a layer of crystals as a reflector.

**Miniature Angle Counter.** Moving tape on this counter used in aircraft (approx. 3½" long) shows horizontal angular deviation from pre-set point. MPB bearings on key shafts help keep torque at approximately 0.1 ounce-inch at temperatures from -55°C to +125°C!



**Man with Miracles.** Scott Claytor is constantly helping industry and aviation to solve problems of friction and inertia with MPB bearings. Like all MPB Technical Representatives, he'll be glad to help you meet the challenge of miniaturization efficiently and economically.

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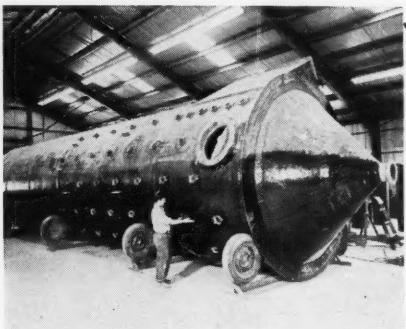
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DESIGN ENGINEERING MAY 1960

## Reports — A world roundup of engineering and design interest



### Plastic monster for scrubbing fumes

Take a look at this monster. It's believed to be the largest unit of industrial equipment ever fabricated from reinforced plastic. Turned on end, as it will be when erected (the conical section at the bottom of the installation), it measures over 47 ft high and 10 ft in diameter. Name of the big fellow is Chemical Fume Scrubber. It's designed to handle 42,000 cfm of dust laden gases. You can see here the entry duct (top right), spray nozzle connections and inspection port. The plastic used in constructing the shell is a polyester, Hetron® 92, reinforced with fibre glass. The only metal used is in supports and external fasteners. Weight considerations recommended plastic. A steel unit of comparable size would likely weigh up to ten times more.



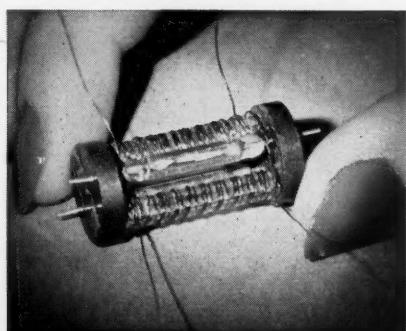
### Clean room = clean meters Stark finds

This clean and tidy assembly area, at Stark Electronic Instruments Ltd., is called, for obvious reasons, the White Room. It was specially designed, with complete control of dust, humidity and temperature, for the assembly of meters. Use of the facility permits the company to manufacture meters of extremely low sensitivity in ideal conditions. Minute dust particles and humidity are known to have a serious influence in the performance of the final product. In addition to the White Room, the company have also recently installed an environmental test laboratory. There technicians test products to MIL and JCNAAF specifications. A high impact shock machine, for light equipment, a vibration table and a random drop test machine form part of the laboratory equipment.



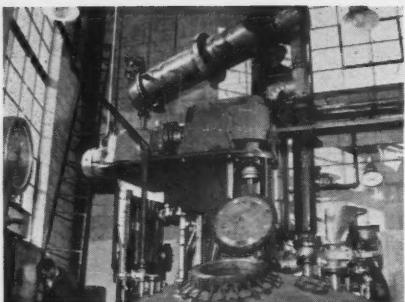
### Designs device for big fry in prison

How would you like the job of frying over 2,000 eggs in a very limited time? This was a task that faced Edwin Gangwer every day and he doesn't mind admitting that he felt like quitting for easier work — like engineering. From what we've seen of his ingenuity, looks like he would make a good engineer at that. Gangwer, who is food service manager at Virginia State Penitentiary, faced up to his egg frying problem with an invention of his own — the Multi Egg Fryer. You see it here. It's made entirely of stainless steel. To operate, Gangwer cracks two eggs into each cup, flicks the lever and spills the eggs into the rings, all at the same time. Result is that they all finish frying at the same time, too. His record to date is 2,304 eggs fried in 19 minutes.



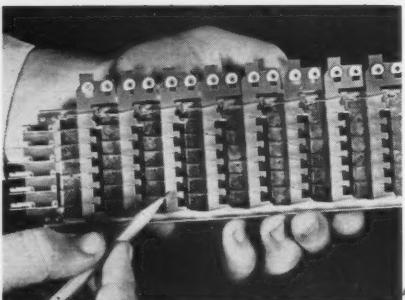
### Bell's super speed switch is a ferreed

This is a ferreed. What's a ferreed? It's a very fast electro-mechanical switch with metallic contacts, requiring no holding power, that has been developed at Bell Telephone Laboratories. This particular ferreed is a two branch model. It consists of two ferrite bars, two glass sealed magnetic reed switches and two plastic end pieces. Non-conducting electrically, the plastic end pieces magnetically couple the ferrite bars to the magnetic reed switches, as well as giving structural support to the assembly. The passage of magnetic flux through the metallic members of the reed switch closes a circuit. Control pulses of five microseconds through the windings on the ferrite will switch the magnetic material. Opening of the contacts requires even less time than closing.



## But Polly can't put this kettle on

What looks like a cross between a submarine conning tower and an astronomer's telescope is in reality a synthetic resin reactor. The unit went on stream recently at the Toronto plant of The Glidden Co., Ltd. It will be used to produce a wide range of resins and emulsions—alkyds, ureas, epoxies, acrylics and polyesters. The reaction kettle is radiant heated and temperature is controlled by a cascade control system initiated by the required temperature for the batch. This gives one percent control over the range of 100°F to 600°F. The kettle has a capacity of 2,400 Imperial gallons and the batch can be reduced as desired in a 4,800 gallon reducing tank.



## Small plastic part meets tight specs.

The problem of tolerance build-up in punched laminated plastic parts, as when several punched holes or cutouts are made over the length of one piece, is not the bugaboo that many designers believe. So says Taylor Fibre Co. To support the contention, it cites a part made by a manufacturer of intricate crossbar switches. Total tolerance build-up of six punched out sections in the part, an insulated pusher bar, must be held to less than .002 in.; flatness must be held to within plus or minus .005. These tight specifications were met by using the company's Grade XXXP phenolic, although dimensions of the part are only: length—2.955 in.; thickness—.031 in. The parts are hot punched.



## Saviour of sheets: the simple spring

Boeing Airplane Co., had a problem: distortion of thin gauge aluminum sheets during heat treating. Here's the, oh, so simple, answer: spacer springs. The springs are made of H-11 die steel and retain their tension through hundreds of heat treat cycles. In several months of production, the springs have been found easy to apply and economical to use. They hold coiled aluminum sheets firmly in position when the sheets are placed in heat treat furnace racks. Space provided by the springs between the coils permits uniform heat distribution and quench water circulation. The technique has resulted in improved quality and reliability, with fewer rejections, we are told.



## Case of comfort for summer's swelter

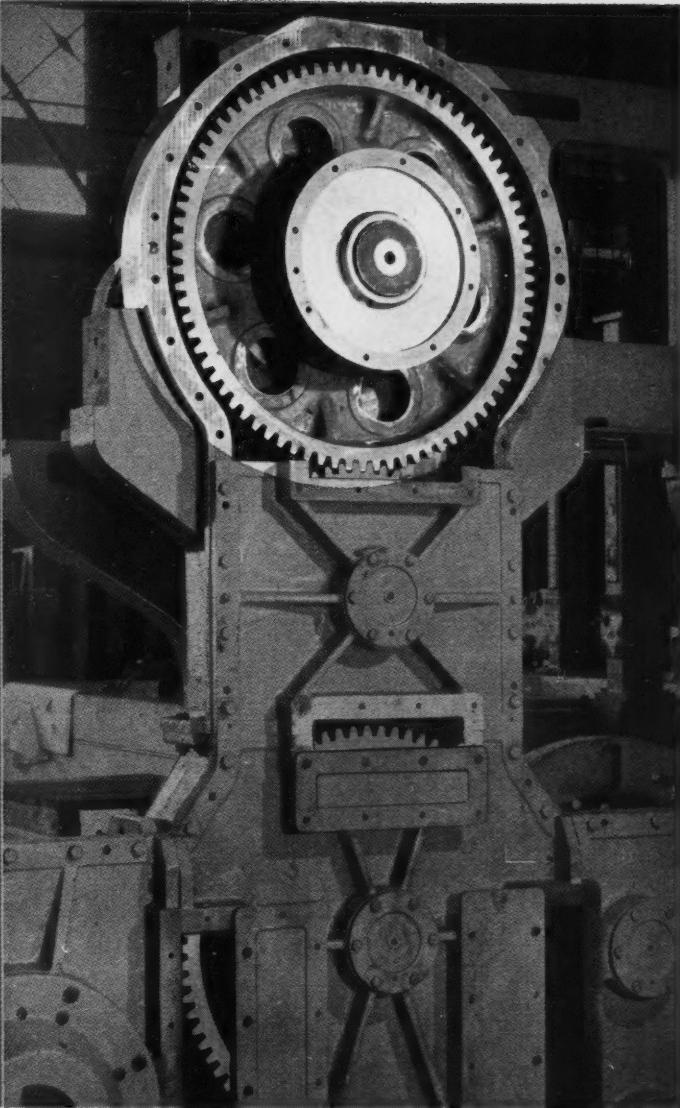
They say that this cooler is so well insulated that a 25 lb block of ice will likely last longer than a week. It's made from Dylite expandable polystyrene and the manufacturer tells us that it keeps food and drink hot or cold longer than heavier and costlier materials. The tightly fitting lid prevents hot or cold air penetration, and an outlet at the bottom provides drainage. Its qualities are many: it floats, is rust-proof, food-odor-free, non-absorbent, durable and lightweight. But what sells us is the thought of a supply of cooling liquids during the coming swelter season. And don't be fooled by this photograph. Drinks other than soft ones can be cooled.



## Aluminum extends home out into garden

How can you use aluminum in the garden? The Aluminum Company of America, which has a natural interest in such questions, asked landscape architect Garrett Eckbo to look around for the answer. After experimenting around his own backyard Eckbo's answer sounded like a big hurrah for aluminum. Using mostly standard items of aluminum, such as extruded shapes, natural and color anodized sheet, in plain and textured finishes, and expanded and decorative meshes, he merged his house right into the garden. Design includes an overhead sun break, mesh screens and solid panel walls. Also in the garden is an open sided pavilion and a fountain that, shaped in aluminum, abstractly suggests a flower.

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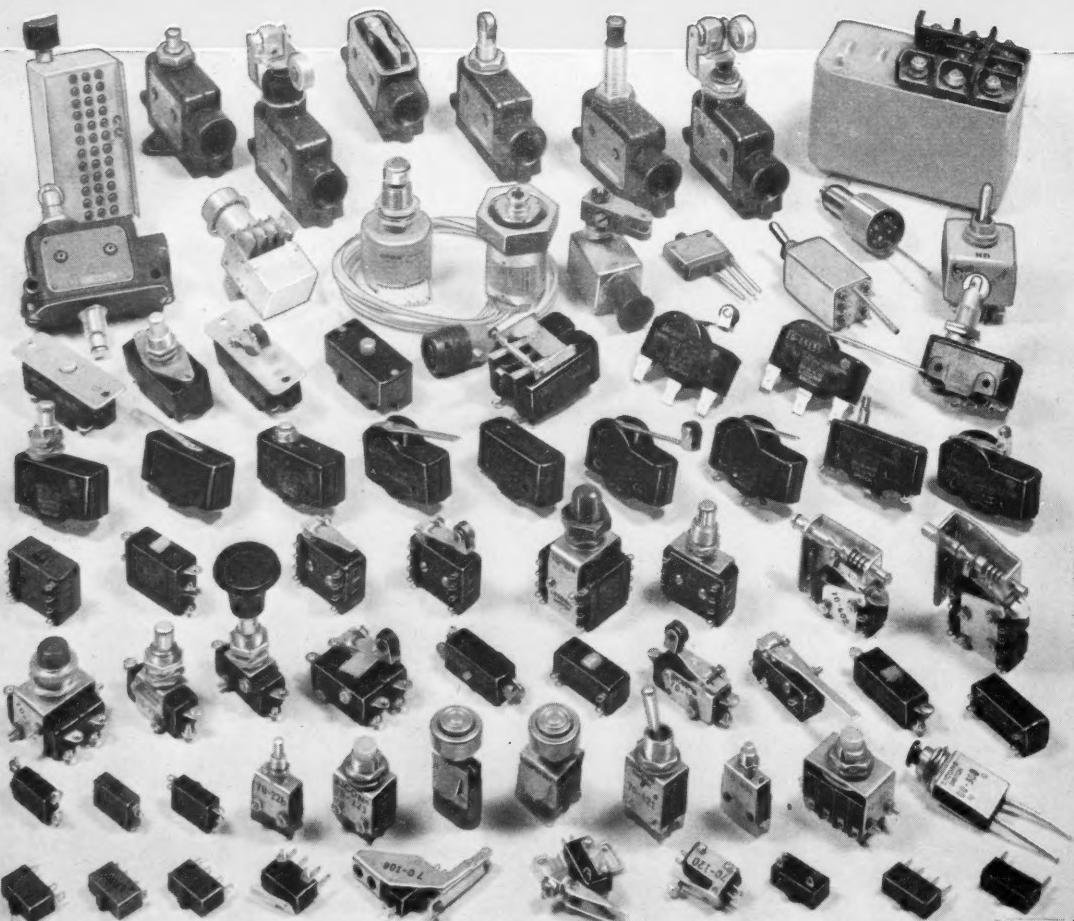
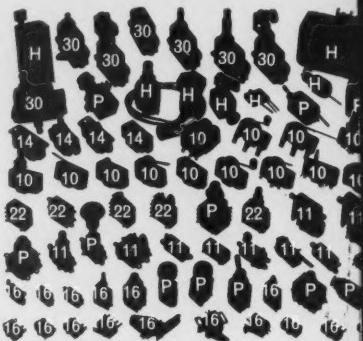
**Type 11 Panel-mounted Switches** —New Serpentine action mechanism delivers 10 million operations without failure. Can be provided with movement differentials as low as .0005". Rated 15 amps.

**Type 22 Double-break Double-throw Switches** —Provide positive control of four independent circuits. Simplifies controls for multiple circuit applications—withstanding 25G at 2000 cps. Rated 15 amps., 125/250V a-c, 30V d-c (res.).

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## Canadians in Britain



Six Athlone Fellows of Canada are touring a number of British factories as part of their two year study course in the U.K. They are shown here in the John Thompson Limited, Wolverhampton, company restaurant. From left to right they are: C. Lemyre (Laval), P. E. Tremblay (U. of Montreal), L. P. Lemay (U. of Ottawa), two Thompson employees, C. Symon (U. of Montreal), G. Luneau (Sherbrooke) and C. Roy (Laval).

## Leland Electric all-Canadian

Reversing the trend towards foreign ownership of Canadian firms, a group of Canadian investors has purchased the Leland Electric Motor Division of AMF Canada, and the new firm will be known as Leland Electric Canada Limited. Following thirty years of U. S. ownership, Leland is now a fully integrated and independent Canadian company.

Leland is Canada's largest exclusive manufacturer of electric motors, generators and alternators. Its manufacturing facilities are located in Guelph, Ontario, and branch offices and warehouses are maintained from coast to coast.

## Long range planning

It may look to be jumping the gun a little, but we have been asked to announce the next Gauge and Tool and Power Press Exhibition will be held at Olympia, London, for the first ten days of October, 1962. There will be a special "Canadian Day" during the show — so start making plans now.

## What they are saying

"A hierarchy of computers similar to those already employed in our military defense system may control complete industrial plants within the foreseeable future"—J. M. Madigan, speaking to American Management Association.

"The junior college cannot be indefinitely overlooked . . . they would increase the number of students completing their undergraduate training"—R. D. Mitchener, Dominion Bureau of Statistics.

"An engineering degree is no longer a passport for college graduates to executive sized jobs and salaries"—D. H. Moyer, Cornell University.

"Electrical engineering, as such, is about to disappear. It will be split into two areas, electrophysics and electromechanics"—Prof. Truxal, dean of engineering, Brooklyn Polytechnic Institute.

"The fact that our Canadian team is placing all its best on one reactor type should not blur our ideas as to the form in which other people may want to buy their uranium fuels"—J. Davis, B.C. Electric Company Limited.

## Industry announcements

John Inglis Company has announced that it will be moving the manufacturing operations on transformers, motors, switchgear, and other electrical apparatus from St. Catharines to a new factory building to be built in Scarborough, near Toronto.

Naugatuck Chemicals is building a new plant in Western Canada to produce a number of chemical products. Location—Strathcona, Alberta.

Monsanto Canada Limited are expanding their facilities at the company's plant in LaSalle, Quebec, where plasticizers are produced.

Brunswick of Canada, as part of their opening ceremonies at their new plant in Dixie, Ontario, announced that they would be furnishing three classrooms and a playroom at the School for Retarded Children, in nearby Cooksville, as its contribution to the work being done by the school.

Canadair Limited has started production of the first sub-assemblies for the Luftwaffe's new Super-Starfighters. This subcontract by the designers of the supersonic NATO fighter to Canadair lays the basis for production by the Montreal company of 200 of the same aircraft for the RCAF in Europe.

The Steel Company of Canada are building a \$900,000 dust controlling precipitator into the new open hearth furnace under construction. Having lived some time in Hamilton, your DE editor agrees wholeheartedly with the project.

## Ottawa report

*Don Peacock, Ottawa Editor*

New hydro-electric generating capacity of 2 million hp was installed in Canada last year, the Department of National Resources reports. It was the second record installation year in a row.

Other installations are expected to add about 1.7 million hp during 1960, and an additional 2.3 million hp of new capacity is either under construction or in the active planning stage.

Canadian construction interests associated with a Blenheim, Ontario farmer-businessman have invaded the elevator-building business behind the Iron Curtain. With men and machinery from Canada, they will build a 250,000 bushel elevator on one of Rumania's biggest state farms, Agriculture Minister Harkness reports.

Sometime this summer three Canadian architects asked by the Royal Architectural Institute of Canada to appraise this country's "residential environment" will report their observations. Already, from preliminary comments, it is obvious that what they have observed was far from perfection. There is a feeling of a general lack of imagination in Canada's housing. And what about multi-dwelling housing? And Canada's zoning bylaws?

continued ➤

## Another AECL contract

Atomic Energy of Canada Limited has entered into a new five-year contract with AMF Atomics (Canada) Limited for the development and manufacture of nuclear fuel elements for this country's atomic research and power problems.

AMF is the only company in Canada organized solely to supply nuclear components. Located in Port Hope, Ontario, they are the fabricators of the nuclear fuel used in Canada's NRX and NRU reactors at Chalk River. The AMF plant is believed to handle a larger tonnage of uranium than any other privately owned fuel fabricator in the world.

## EIC activity

G. M. Dick, MEIC, of Sherbrooke, Quebec has been elected President of the Engineering Institute of Canada for the year 1960-61. He will be inducted into office at the annual meeting at Winnipeg this month. Mr. Dick has pioneered the design of many mine-hoists used in Canada today. During World War I he was the designer of special war-time manufacturing equipment.

## Mining techniques

A mining technique proven in Europe but new in the Western Hemisphere is being imported by International Minerals & Chemical Corporation (Canada) Ltd. to assure long-term efficiency and safety in the operation of its potash mine now under construction in Saskatchewan. The new technique, called "tubbing," employs a cast-iron lining for the mine shaft. It is a vertical application of cast-iron vehicular tunneling commonly used under rivers and lakes.

## A calendar for design engineers

| Fri. | Sun. | Tues. | Fri. | Wed. | Thurs. | Sun. |
|------|------|-------|------|------|--------|------|
| 7    | 6    | 5     | 4    | 3    | 2      | 1    |
| 14   | 13   | 12    | 11   | 10   | 9      | 8    |
| 21   | 20   | 19    | 18   | 17   | 16     | 1    |
| 28   | 27   | 26    | 25   | 24   | 1½     | 22   |

We've seen a number of variations of this theme, but here is what we believe to be best yet. With this calendar:

- You can get the job done yesterday. Start on the 7th, finish on the 1st, for instance.
- Deadlines set for the 1st give you two chances per month to be on time.
- Since customers always want their orders on Friday, two Fridays have been included in every week.
- No Mondays for time-wasting meetings.
- Since Sunday is the only day on which design engineers can get things done, every week has two Sundays.
- There is no 15th or 30th—bills falling due on those dates don't have to be paid.
- Thirty-day notices may be ignored—since there are only 27½ days in the month.
- The one half day has been allotted for salesman calls.

## Cash in on design ideas

Everybody wins a prize in the 1960 Design Contest sponsored by the Gray Iron Founders' Society, national trade association for the foundries of U.S., Canada and Mexico. First prize will be \$500 in cash; second place will win \$100; and there are five other prizes of \$50. In addition every bona fide entrant will receive a \$10 Gray Iron Castings Handbook.

Judging of entries will be on the basis of cost savings, commercial importance, design ingenuity and how the design increased the efficiency of the product. Deadline for entries is May 31, 1960. So act fast.

## Seen and heard

Yvon R. Tassé, P.Eng., M.P. for Quebec East, and Parliamentary Secretary to the Minister of Public Works, told DE during the annual meeting of the CIPQ in Montreal that there is no better background for public life than that of engineering. "Government decisions are being based more and more on technological considerations," he said.

Trevor Beard, P.Eng., chief engineer of the newly organized company, Fluid Power Limited, escorted your editor through their shops and those of the Viceroy Rubber Company. Mr. Beard advised that they will continue to manufacture and service 'Viceroy' presses and other equipment previously marketed by the predecessor Viceroy Engineering.

Your editor also spent a couple of interesting hours at the plant of Dominion Fasteners in Hamilton, Ontario. We must admit that we have never seen so many varieties of fasteners in one place at one time.

## Coming Events

- March 23 to June 19—Porcelain Enamel Show, New York, N.Y.
- May 9 to 13—Society of Photographic Scientists & Engineers, Santa Monica, Cal.
- May 9 to 13—Castings Congress and Exposition, Philadelphia, Pa.
- May 23 to 26—Annual Design Show, New York, N.Y.
- June 6 to 8—Canadian National Business Show, Toronto, Ont.
- June 12 to 17—Design Engineering Seminar, Penn State University.
- June 13 to 15—Annual Conference of Chemical Institute of Canada, Ottawa, Ont.
- June 13 to 17—International Powder Metallurgy Conference, New York, N.Y.
- June 20 to 22—ASME Applied Mechanics Conference, University Park, Pa.
- June 27 to 29—Creative Problem Solving Institute, University of Buffalo.
- September 6 to 16—Machine Tool Exposition, Chicago, Illinois.
- September 26 to 28—Standards Engineers Society Annual Meeting, Pittsburgh, Pa.
- September 26 to 30—Material Handling Show & Conference, Montreal, Quebec.
- November 8 to 11—Die Casting Exposition, Detroit, Mich.

# **BAKELITE Phenolic Molding Compound**

## **acclaimed by today's homemakers**

**as...**



Saucepan designed by Duro Aluminum Ltd., Hamilton  
Handle and knob molded from BAKELITE  
Phenolic (TM5498) Molding Compound, by  
Thermoset Plastics Limited, Dorion, Quebec

## **the perfect material for houseware handles**

BAKELITE Phenolic Molding Compound has stood the test for many years as the ideal material for houseware handles, knobs, and component parts.

Its outstanding advantages easily explain this wide public acceptance . . . smooth lustrous finish . . . heat resistant . . . readily washable and immune to chemicals, acids and food stains.

In manufacture, BAKELITE Phenolic Molding Compound has excellent features, such as wide latitude moldability—close tolerances—easy machineability—dimensional stability.

An idea-minded plastic molder can give you new thoughts as to where you can use BAKELITE Phenolic Molding Compound to improve product quality and appearance . . . to create greater sales appeal.

**BAKELITE COMPANY**

Division of Union Carbide Canada Limited

**TORONTO • MONTREAL • VANCOUVER**

BAKELITE and UNION CARBIDE are trade marks



**A CHIEF SUPPLIER OF PLASTIC RAW MATERIALS TO INDUSTRY**

For further information mark No. 108 on Readers' Service Card

*new... low cost... for all vertical screw driving operations...*

# STRIPPIT ZIPP SCREW FEEDERS

*save time... cut costs... reduce worker fatigue*

**save 2 to 25 seconds per piece per station** — the new Strippit Zipp Screw Feeder completely eliminates production time lost in manual screw placement.

**reduce errors and rejects** — worker fatigue with its resulting loss of production efficiency is cut to an absolute minimum.

**automatically feeds and drives all type screws** — will feed and drive slotted, socket, clutch, hex or Phillips head screws even where clearances are extremely limited.

**high efficiency, long run production** — these units are particularly effective for the assembly of appliances, electronic and electrical components — and any application requiring continuous vertical screw driving operations.

**for all makes of air and electric tools** — Zipp Screw Feeders are designed to fit perfectly on all makes of power screw drivers. They are factory set to fit your present or new equipment.

**precision built for accurate operation** — the screw holding collets of these machines are precision machined to hold screws accurately and firmly for finding screw holes. There are no delicate mechanisms to get out of order.

**low cost, high speed, ease of operation** — all contribute to production line economies that enable Strippit Zipp Screw Feeders to pay for themselves in from 30 to 120 days.

**WRITE FOR FULL DETAILS** — new illustrated literature, complete specifications, price and delivery.



**STRIPPIT ZIPP SCREW FEEDERS MOUNT**  
**ANYWHERE** — on a balancer, fixed position stand, kick press lift table, swing arm tool mount and numerous other ways to meet your individual requirements.



**STRIPPIT**  
**TOOL & MACHINE COMPANY**  
*A Division of Provincial Engineering Ltd.*



*A Unit of Houdaille Industries, Inc.*

103 Hansen Road • • Brampton, Ontario

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# **Can you pass this test on Polyethylene Plastics?**

*(You'll profit by knowing them better)*



**3** Polyethylene film protects expensive business machine in transit against:  
(a) dust                   (b) moisture                   (c) high packing costs



**ANSWERS... to an increasing range of needs are found in UNION CARBIDE Polyethylene.**

1. (b) Battery acid—unbreakable polyethylene bottles are inert to almost all chemicals.
  2. Check (a), (b) and (c)—plus no scaling; unharmed by freezing.
  3. Check (a), (b) and (c). Film eliminates expensive air-tight wooden shipping crates.
  4. (a) and (b) are right—so (c) is a natural.
  5. (c) Five important ways—non denting, light weight, integral color, less noise, and resistance to chemicals.

**If you have questions**—about polyethylene and its potential for your business—please ask us. Just write or call any of our offices or write Carbide Chemicals Company, Division of Union Carbide Canada Limited, 40 St. Clair Ave. E., Toronto 7, Canada.

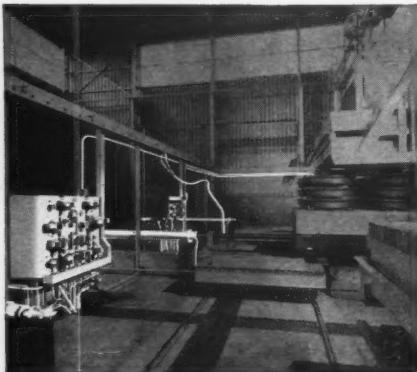
**UNION  
CARBIDE** *POLYETHYLENE*

**UNION CARBIDE** is a trade mark.

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## VICKERS<sup>®</sup> PACKAGED ELECTRO-HYDRAULIC SYSTEM makes possible automatic heat treatment at Canadian Steel Wheel



Vickers control console at top of page gives operator remote control of normalizing furnace operations. Control console, power units, and valve panels like the one shown above are all part of the Vickers-Sperry package.

A combination of closed circuit TV and electro-hydraulic control permits a fully automatic heat treatment cycle for wrought steel wheels at Canadian Steel Wheel Limited's ultra-modern plant in Montreal. Depressing a selector button is all it takes to initiate a cycle. This new integrated plant can produce 200,000 wrought steel wheels per year to meet the increased needs of Canada's railways. This is accomplished by using the latest in automated manufacturing procedures and inspection techniques.

Vickers-Sperry of Canada Ltd. designed and manufactured the complete electrical and hydraulic control system for movement of wheels through the 90-foot long heat treatment furnaces. The complete "packaged" job included installation and startup of the equipment.

Although Vickers-Sperry "Packaged Systems" like this one are developed for specific installations, they use standard components throughout . . . thereby cutting original cost and simplifying maintenance because spare parts and service are readily available. You get not only single source convenience but *single source responsibility*.

A Vickers-Sperry application engineer can survey your requirements and show you how a packaged electro-hydraulic system offers the most efficient solution to your operating needs. Further information is available in Bulletin 59-74, write for your copy today.

### VICKERS-SPERRY of Canada Ltd.

Division of Vickers Incorporated

SPERRY RAND CORPORATION

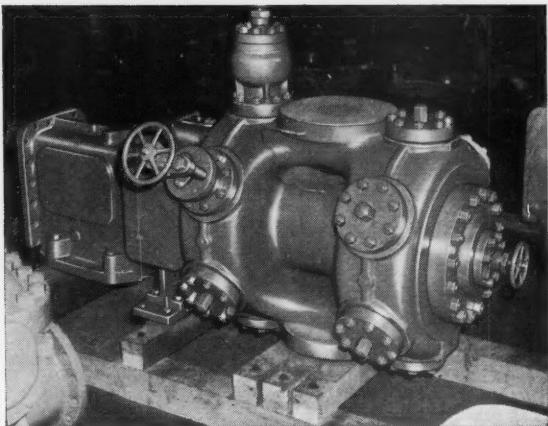
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VANCOUVER—1637 West 5th Ave. • TORONTO—92 Advance Rd. • MONTREAL—318 Victoria Ave.

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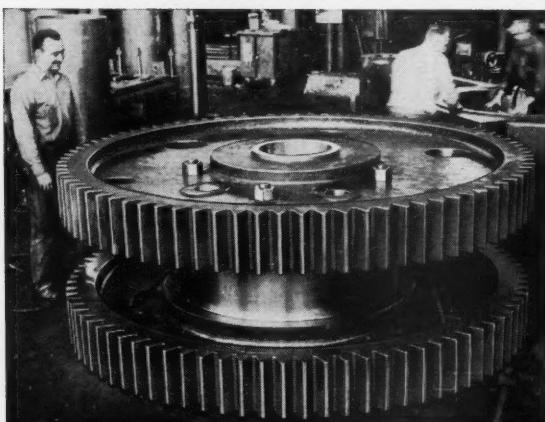
# DUCTILE IRON the cast iron with the advantages of steel



Ductile Iron cylinder unit for use on natural gas compressors designed to meet 650 psi suction and 940 psi discharge—cast by Canada Iron Foundries Limited for Worthington (Canada) Ltd., Brantford, Ontario.

Ductile Iron is a type of cast iron that can be twisted and bent without breaking. It can be cast in intricate shapes as easily as ordinary grey iron . . . yet it has strength and wear-resistance properties similar to tough steel. Ductile Iron resists heat and corrosion . . . withstands heavy shock . . . machines easily . . . and can be welded to cast iron or steel. Many engineers are redesigning in Ductile Iron because of its processing advantages and steel-like characteristics. Six grades are available suitable for a wide range of applications.

## NICKEL ALLOYED DUCTILE IRON for better strength and wear



These two nickel alloyed Ductile Iron gears were machined and bolted together for assembly into one of the largest of E. W. Bliss presses. Nickel increased hardenability for greater wear and surface fatigue resistance.

Ductile Iron alloyed with nickel offers increased tensile strength, yield strength with controlled hardness. Better wear and surface fatigue resistance plus uniform hardness through heavy sections are obtained by nickel additions in Ductile Iron. Responses to all heat treatments are enhanced by nickel, resulting in tensile strengths to 175,000 psi, yield strengths to 150,000 psi and Brinell hardness when flame-hardened to Rockwell C 60.

### *Proven in-service applications of Ductile Iron are:*

#### **DUCTILE IRON CASTINGS** are available from these suppliers

Bell Foundry Limited  
St. James, Man.

Canada Iron Foundries Ltd.  
Montreal and Three Rivers, P.Q.  
Toronto and Hamilton, Ont.

Holmes Foundry Limited  
Sarnia, Ont.

Letson & Burpee Limited  
Vancouver, B.C.

McDonnell Metal Mfg. Co. Ltd.  
Vancouver, B.C.

Otaco Limited  
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Welland Iron & Brass Ltd.  
Welland, Ont.

Pressure castings  
Agricultural implements  
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Valves  
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Cylinders  
Connecting rods  
Pinions  
Crankshafts  
Camshafts  
Gears

Pump bodies  
Dies  
Furnace doors, frames  
Grate bars  
Sinter pots  
Annealing pots

**THE  
INTERNATIONAL  
NICKEL  
COMPANY OF CANADA, LIMITED**  
55 YONGE STREET, TORONTO



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# springs

## and other things

*from the Engineering Team at Wallace Barnes.*

These are just a few examples of the many thousands of different springs produced by Wallace Barnes in lots of a few . . . or thousands. The successful production of this large variety depends on the knowledge and experience of the Wallace Barnes team of engineering experts. These men, skilled in every phase of spring-making, guarantee the most efficient design, the most durable product, and the most economical production in any quantity.

Send for your FREE copy of "Pocket Guide to Springs and Other Things". A pictorial guide of our products and services.

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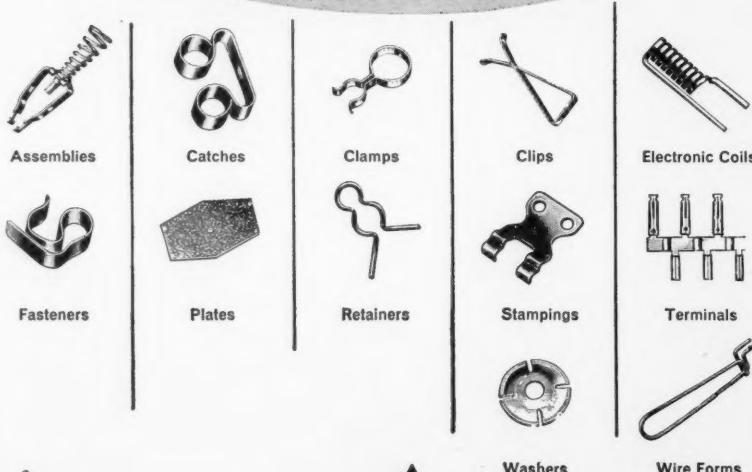


## The Wallace Barnes Company Ltd.

Hamilton, Ontario—Montreal (Pointe Claire) Quebec

Sales Agent: E. A. Tipping Sales Ltd., Winnipeg—Vancouver (Richmond)

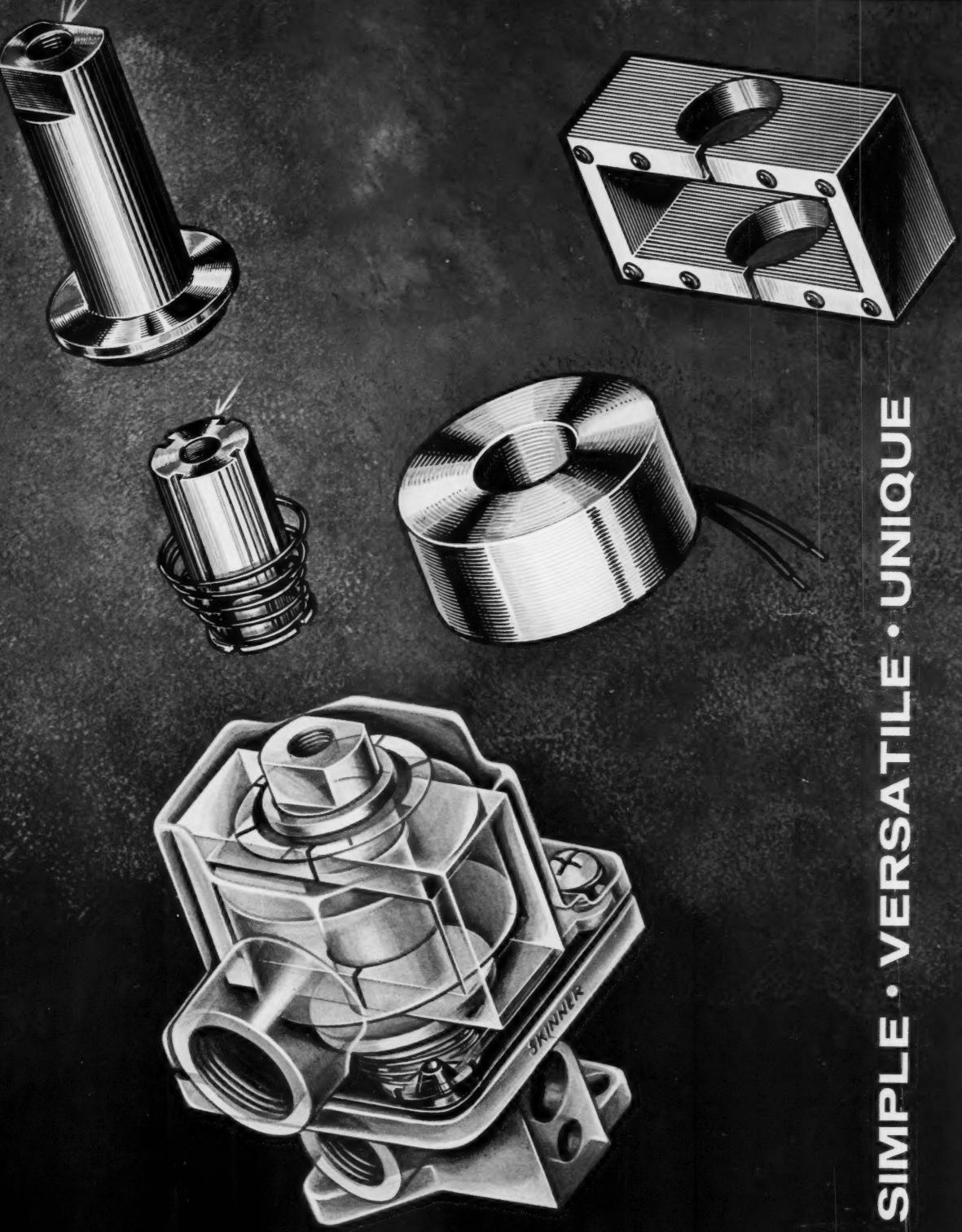
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Subsidiary of  
Associated Spring  
Corporation



SIMPLE • VERSATILE • UNIQUE



New **SKINNER** 3-way Solenoid Valves

# All Skinner Solenoid Valves are...

## SIMPLE—

Only two moving parts in direct acting valves. Stainless steel internal parts resist corrosion. Soft synthetic inserts provide bubbletight sealing. Most types available in explosion-proof construction.

## VERSATILE—

Literally thousands of variations are possible—mounting, flow control and porting . . . electrical options in coils, voltages and frequencies . . . types of media, operating temperatures, etc.

## UNIQUE—

Skinner valve seat does not cut inserts, assures bubbletight sealing and long life. Skinner valve sleeve assembly is precision welded to provide over 5,000 PSI burst strength. Skinner standard valve designs are readily modified for custom applications. From first step in manufacturing to delivery, Skinner quality control and 100 per cent testing builds valves Skinner guarantees for long, trouble-free life.



A—Transparent view of normally closed valve with main orifice shown  
B—Plunger and spring C—Sleeve D—Coil E—Yoke

## SKINNER three-way solenoid valves solve your control system problems

Whatever your problem in controls . . . in machine tool automation, automatic clutching or braking, packaging, instrumentation, laundry equipment, air conditioning, or in any of thousands of applications involving air and hydraulic cylinders or pressurized mechanisms . . . Skinner has the answers.

Skinner design leadership and quality manufac-

ture of solenoid valves has been proved by universally successful use. And as control problems become more complex, Skinner keeps pace with new designs, new valves, and continued top quality production.

The new A series shown above, the new L series, the V5 and V10 series complete the line of Skinner 3-way solenoid valves. Your selection is unlimited.

|                        | V5 Series   | V10 Series  | A Series  | L Series   |
|------------------------|---|---|---|--|
| Orifice sizes          | 1/2" to 1/4"  | 3/32"   | 3/32", 1/8", 5/32"  | 5/8", 1/8", 3/4"   |
| Pressure Ratings       | Up to 200 PSI   | 1000 PSI  | Up to 250 PSI   | 5 to 150 PSI   |
| Types                  | Normally open,<br>normally closed,<br>directional control,<br>multi-purpose | Normally open,<br>normally closed,<br>directional control,<br>multi-purpose | Normally open,<br>normally closed,<br>directional control,<br>multi-purpose | Normally open,<br>normally closed,<br>directional control                    |
| Construction           | Stainless steel body<br>Stainless steel<br>internal parts                   | Stainless steel body<br>Stainless steel<br>internal parts                   | Zinc die-cast body<br>Stainless steel<br>internal parts                     | Forged naval<br>brass body<br>Stainless steel<br>and brass<br>internal parts |
| Body Pipe<br>Connector | 1/8 and 1/4 NPT   | 1/8 NPT   | 1/4 NPTF  | 5/8", 1/2", 3/4" NPTF  |

When you specify solenoid valves, specify Skinner.

Skinner solenoid valves are distributed nationally.

For complete information, contact a Skinner Representative listed in the Yellow Pages or write us at the address below.



THE CREST OF QUALITY

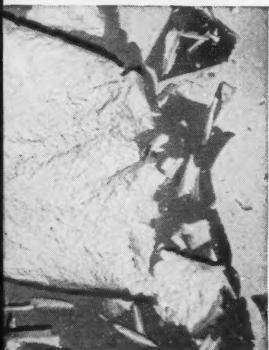
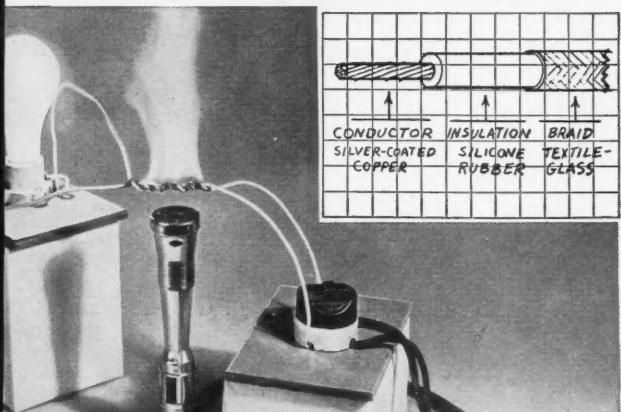
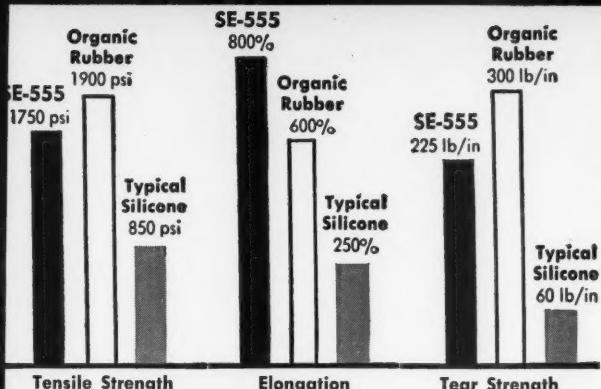
# SKINNER ELECTRIC VALVES

SKINNER ELECTRIC VALVE DIVISION,  
THE SKINNER CHUCK COMPANY • NEW BRITAIN, CONNECTICUT

## HOW TO SOLVE PRODUCT DESIGN PROBLEMS WITH



## SILICONE IDEAS



Carbon steel coated with an alkyd aluminum finish, subjected to 1000°F for 2 hours.



Carbon steel coated with silicone aluminum finish, subjected to 1000°F for 24 hours.

**Problem:** Organic rubber parts failing because of temperature extremes and ozone. High tear and tensile strength cannot be sacrificed.

**Solution:** Replace with SE-555—silicone rubber with tear and tensile strength comparable to organic rubber.

SE-555 is a new silicone rubber with tear and tensile strength double that of ordinary silicone rubber (see comparative typical values at left). Whenever maximum resistance to weather and temperature extremes (minus 150°F to 500°F) is required, combined with high tear and tensile strength, specify SE-555. This is the only material available to rubber fabricators that meets AMS 3345 requirements for tear and tensile strength, elongation, heat resistance, compression set and low temperature flexibility. SE-555 can be fabricated in practically any color, including white.

You can order high strength silicone rubber parts immediately because SE-555 is available from stock for shipment to your fabricator. For more information and a list of qualified fabricators, mail the coupon below.

**Problem:** Find a wire insulation to withstand extreme conditions of temperature, moisture and ozone.

**Solution:** Wire insulated with G-E silicone rubber.

Exposed to an 1800°F flame for hours, G-E silicone rubber insulation forms a non-conducting ash which still insulates. No toxic fumes are released, nor will it shrink and expose the conductor, as the laboratory demonstration on the left shows. Silicone rubber has superior dielectric strength at high temperatures and keeps it for years. It has unparalleled ozone resistance, stays flexible down to minus 75°F or lower. Use silicone rubber insulated wire wherever temperatures are extreme, and where an extra safety margin is needed. Examples: aircraft wire, Class B and H motor and apparatus lead wire, electronic hook-up wire and control cable. Want more information? Send in coupon below.

**Problem:** Extend the life and appearance of metal surfaces designed for high temperature operation.

**Solution:** Special paints made with G-E silicones.

Silicone based paints are finding increased application as corrosion-resistant or appearance-preservation coatings for many metals exposed to continuous temperatures as high as 1000°F. For instance, special aluminum-silicone paints often make it possible to use mild steel instead of stainless steel in industrial applications. High gloss silicone paints have proved to be amazingly durable finishes for heaters, appliances, etc. Gloss and color are retained up to 440°F, and the finish resists marring, scratching and chemical attack more than ordinary paints. Check into the performance advantages of high temperature silicone paints. Special paint formulations have been developed by leading paint manufacturers for specific temperature ranges and applications. For more data, fill in the coupon below.

Chemical Materials Sales  
Canadian General Electric Company Limited  
940 Lansdowne Avenue, Toronto 4, Ont.

457W-358

Please send me application data and names of suppliers of:

- Silicone rubber mechanical goods  
 Silicone rubber insulated wire       Silicone based paints

Name ..... Title .....

Company .....

Address .....

City ..... Prov .....

**GENERAL ELECTRIC  
SILICONES**

INDUSTRIAL PRODUCTS DEPARTMENT  
CANADIAN GENERAL ELECTRIC COMPANY LIMITED

HIGH STRENGTH RUBBER PARTS

HIGH TEMPERATURE WIRE INSULATION

HIGH TEMPERATURE PAINTS

The Saturday Evening POST

*Running in this town*

**ONLY**

**15¢**

**AN ILLUSTRATION BY RAYMOND BRADBURY**

**Now BONDERIZED  
and painted aluminum  
keeps your home looking  
fresh and clean for years longer!**

Today's homes keep that fresh, new look longer because of great advances in material and quality finishes.

Aluminum, treated with BONDERITE and finished with baked-on paint by the manufacturer, is one of the greatest contributors to an almost maintenance-free home. Siding, roofs and shingles, gutters and downspouts, screen and storm windows, screening, awnings are all available now in Bonderized and painted aluminum for new homes and for remodeling.

With BONDERITE under the paint, the attractive finish lasts years longer. No rust to streak or stain. Peeling, flaking and blistering no longer a problem. BONDERITE anchors paint, retards corrosion and assures years and years of maintenance-free paint.

When you buy painted aluminum products, be sure they are BONDERIZED.

**1 SIDING**—Aluminum for exterior use in conventional siding and in board and batton, in a range of colors.

**2 ROOFS AND SHINGLES**—Put the durability and finish life of Bonderized and painted aluminum on your roof. In pleasing colors.

**3 GUTTERS AND DOWN-SPOUTS**—Bonderized and painted aluminum here solves one of the most aggravating home maintenance problems.

**4 SCREEN AND STORM FRAMES**—Formed from Bonderized, painted aluminum, with protecting paint unbroken.

**5 GARAGE DOORS**—Paint stays tight and fresh through years of hard service.

**6 AWNINGS**—Lasting protection from sun and weather. Many styles and colors.

(Parker Rust Proof Company furnishes Bonderite to mills and fabricators of aluminum, who manufacture the articles shown here.)

**Parker Rust Proof Company**  
21 E. MILWAUKEE, DETROIT 11, MICHIGAN

BONDERITE corrosion resistant paint base • BONDERITE hot resistant • PARCO LUBRITE—wear resistant for friction surfaces • TROPICAL—heavy duty maintenance paints since 1883 Since 1914—Leader in the field

\*Bonderite, Bonderized, Banderlube, Parco, Parco Lubrite—Reg. U.S. Pat. Off.

# Bonderite helps you sell!!

## PARKER NATIONAL ADVERTISING TELLS YOUR CUSTOMERS ABOUT THE **EXTRA VALUES** YOU ADD WITH BONDERITE FOR ALUMINUM

Here's the latest in the 30-year-long series of Bonderite national advertisements, developing broad knowledge and acceptance for Bonderite as an added value on painted products.

This half-page ad, appearing in The Saturday Evening Post, tells how Bonderite, in the wonderful world of aluminum, increases durability of paint on the many aluminum products used on modern homes.

Remarkable advances in Bonderite for aluminum have made this treatment a virtual requirement before painting aluminum. It provides sludge-free, continuous operation, with quality of coating and

efficiency of the solution checked by a constant, accurate, visual color control. And the Bonderite solution operates indefinitely without dumping. In one plant, quality coatings have been obtained for over three years from a solution which continues to operate without any reason for discarding.

Bonderite is the corrosion-resistant paint bond which is known by name and reputation to your customers. Put this acceptance to work for you by using Bonderite in your finishing operations—and by using Bonderite as a product feature. It can help you sell!

### Parker Rust Proof Company of Canada, Limited

REXDALE BLVD., REXDALE (TORONTO), ONTARIO

BONDERITE corrosion resistant paint base • BONDERITE and BONDERLUBE aids in cold forming of metals • PARCO COMPOUND rust resistant • PARCO LUBRITE—wear resistant for friction surfaces • TROPICAL—heavy duty maintenance paints since 1883

Since 1914—Leader in the field

\*Bonderite, Bonderized, Bonderlube, Parco, Parco Lubrite—Reg. U.S. Pat. Off.

Get full details on Bonderite for aluminum. Check the information you want on the coupon at right. Mail it today!



PARKER RUST PROOF COMPANY of Canada, Limited  
Rexdale Blvd., Rexdale (Toronto), Ontario

- Send me literature on Bonderite for aluminum.  
 Give me details on Bonderite as a product and sales feature.

Name.....

Title .....

Company .....

Address .....

City ..... Prov. ....



**INTERPON\***  
**GOES TO ENGLAND**  
**FOR TCA VANGUARDS**

Perhaps the best testimonial ever received for any finish: Interpon is being supplied from Canada to Vickers-Armstrongs (Aircraft) Ltd. in England for finishing TCA's "VANGUARD" aircraft now on order. The proven superiority of paints and other finishes, developed and produced in Canada for Canadian requirements by International Paints, offers specific advantages in commercial and industrial use, as indicated by this incident. For the best answer to your finishing problems, call on International.

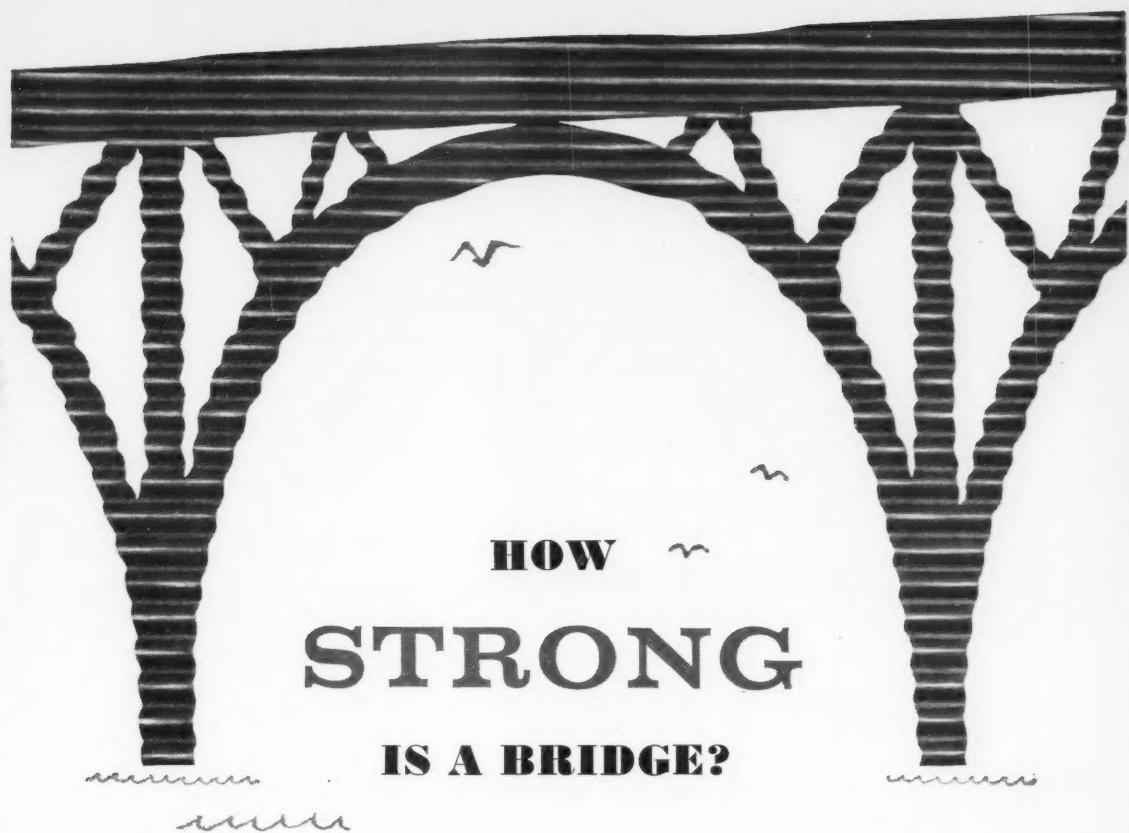


**International Paints (Canada) Limited**

HALIFAX • SAINT JOHN • QUEBEC • MONTREAL • OTTAWA • TORONTO  
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\*International Paints (Canada) Limited brand of catalyzed epoxy paints

For further information mark No. 135 on Readers' Service Card



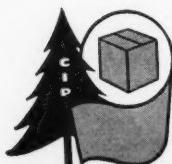
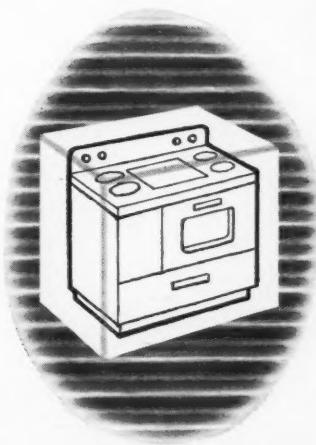
**HOW  
STRONG  
IS A BRIDGE?**

*Much stronger than it looks. Like a bridge, a HYGRADE Corrugated Container can support unusually heavy loads due to the strength achieved by its design.*

HYGRADE's designers and engineers apply new thinking in design-weight ratio to heavyweight shipping problems, bulk packs, and corrugated containers that meet the rigours of shipping with maximum efficiency at minimum cost. They are backed by complete testing facilities, quality-controlled production and up-to-the-minute service.

For containers designed to go places, check with your nearest HYGRADE Sales Office.

PLANTS: London — Toronto — Montreal — St. John's, Nfld.



**HYGRADE CONTAINERS LIMITED**

A subsidiary of

**CANADIAN INTERNATIONAL PAPER  
COMPANY**

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**"SPECIALS"**  
for  
**INDUSTRY**

• *Produced economically to customer requirements!*



**STELCO COLD HEADING**

Five of the pieces shown above are produced by cold heading plus additional secondary operations. Starting with wire of any forgeable metal up to 1" in diameter, Stelco can upset it to at least 4½ times its original diameter to produce contoured components for industry.

Cost reductions of 40% and higher are not unusual when a part is produced by cold heading or hot forming, with secondary operations where necessary, rather than by machining. This saving is realized because material scrap loss is avoided and production rates are increased.

Frequently "special" fastener requirements can be met by simple design changes or additional operations to standard items already in normal production, and Stelco will carry long run "repetitive specials" in stock to provide a ready source of supply.

Consult Stelco's Engineers on the production and design of "Special" Fasteners or parts to your own requirements. Sales Offices are established from coast to coast to serve you.



**THE STEEL COMPANY OF CANADA, LIMITED**

*Executive Offices:* Hamilton and Montreal

Sales Offices: Halifax, Saint John, Montreal, Ottawa, Toronto, Hamilton, London, Windsor, Winnipeg, Edmonton, Vancouver. J. C. Pratt & Co. Limited, St. John's, Newfoundland.

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59192.B





**as  
versatile  
as your  
imagination...**

# STAN STEEL TUBING

New advancements — new improvements in your products are limited only by the boundaries of creative imagination. You'll find that versatile welded steel tubing, fabricated for you by Standard Tube, can solve your design problems.

Let us help you with imaginative design planning for your products.

## STANDARD TUBE AND T.I. LIMITED

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H-2244

For further information mark No. 155 on Readers' Service Card



Aluminum Sheet,  
Bar, Extrusions,  
Tube and Wire also  
available in any  
quantity.

## MOST COMPANIES CAN USE THIS SERVICE TO ADVANTAGE . . .

Company owners, executives and accountants should find it worthwhile to consider the accounting facilities available at the IBM Service Bureau.

Payroll, invoicing, inventory, sales analyses . . . practically any form of accounting and statistical work . . . can be done with speed, accuracy and economy. The job can be large or small . . . on a regular basis, at peak load times or when something special is needed.

All work is done at the IBM Service Bureau, so customers have the use of IBM Data Processing Equipment with no capital outlay, no staff training and they pay only for the work done for them.



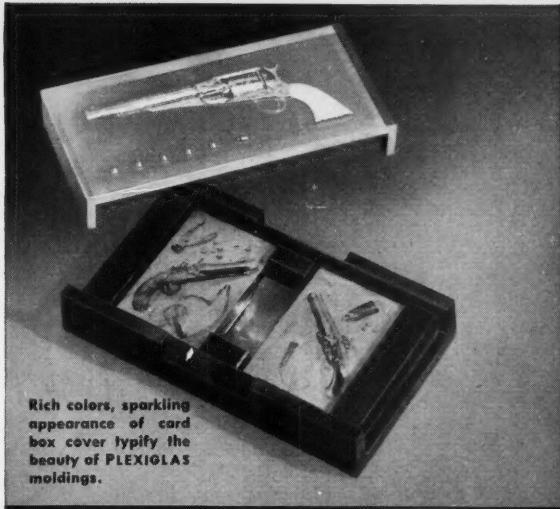
# IBM SERVICE BUREAU

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*Branches in principal cities*

More than likely, IBM Service Bureau can help *your* company. If you would like to investigate the possibilities, an IBM representative will give you a confidential report. Please telephone and say when he may call.

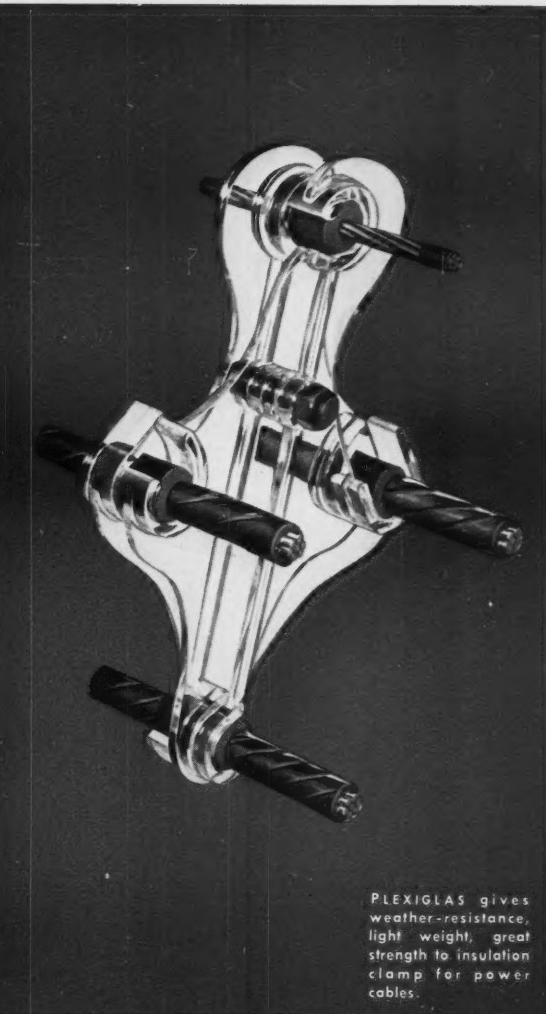
For further information mark No. 133 on Readers' Service Card



Rich colors, sparkling appearance of card box cover typify the beauty of PLEXIGLAS moldings.



Water meter cover molded of PLEXIGLAS has excellent clarity, high resistance to impact.



PLEXIGLAS gives weather-resistance, light weight, great strength to insulation clamp for power cables.

## Designed with **PLEXIGLAS** in mind

Products like those shown above have proved successful because their designers and molders took advantage of the properties of PLEXIGLAS® acrylic plastic. Whether your requirements for a molded part are rugged durability or gleaming beauty, or both, PLEXIGLAS can provide the answer.

Here are the reasons why so many types of products in varied fields of industry today are planned to be molded of PLEXIGLAS—the resistance of this acrylic plastic to weather, heat and breakage . . . its crystal clarity, resulting in depth and brilliance of colors when back-surface paints and metallized coatings are applied . . . the optical effects possible . . . its ability to be molded accurately into complex shapes.

Our technical representatives and Design Laboratory staff would like to show you how PLEXIGLAS can solve specific problems involving molded plastic parts.



*Chemicals for Industry*

**ROHM & HAAS  
COMPANY  
OF CANADA LIMITED**

2 MANSE ROAD, WEST HILL, ONTARIO

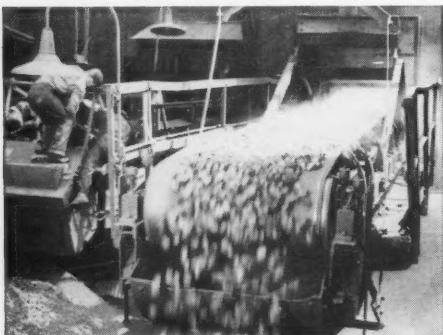
PLEXIGLAS is a trademark, Reg. Canadian Pat. Off. and in principal foreign countries.



OIL RESISTANCE—Pump hose resists gasoline; neoprene cover withstands weathering, swelling, and tendering upon exposure to oils, grease, most solvents.



SUNLIGHT RESISTANCE—Cable jackets tested outdoors for over 24 years. Cable at left is natural rubber; shows cracks. Neoprene cable at right is lively and tough.



HEAT RESISTANCE—Conveyor belt handles hot coke without failure. Neoprene products resist temperatures in range of 176°F to 250°F. Even higher temperatures for brief periods.



LOW COMPRESSION SET—Gaskets of neoprene in compression have good resistance to permanent deformation under loads. Retain sealing properties; resist oils.

## Du Pont Neoprene offers you properties that meet a wide combination of product requirements

In addition to toughness and resilience, Du Pont neoprene synthetic rubber has many other desirable built-in physical characteristics. It resists oil, grease, sunlight, weather and deterioration from ozone, heat and years of aging. Neoprene's properties can be varied to give the right combination of the characteristics required. For example, in addition to properties pictured at the left, neoprene offers:

**SOFTNESS-HARDNESS**—neoprene compounds can be made to meet many service requirements. It's also available in sponge form, open cell or closed.

**TOUGHNESS-DURABILITY**—neoprene resists abrasion, cutting, chipping, wear and tear.

**AIR RETENTION**—neoprene has low permeability to gases . . . retains those that diffuse through rubber.

**RESILIENCE**—compares favorably with natural rubber and is extensively used in engine mounts and other vibration applications.

**LOW TEMPERATURE RESISTANCE**—properly compounded neoprene products retain flexibility at temperatures as low as -67°F.

**FLAME RESISTANCE**—neoprene won't support combustion. Compounds cease burning when flame is removed.

**OXYGEN, OZONE RESISTANCE**—neoprene's superior resistance accounts for excellent aging properties.

For your regular copy of "Elastomers Notebook" and more detailed information on Du Pont synthetic rubber products, write to Du Pont of Canada Limited, 85 Eglinton Avenue East, Toronto 12, Ont.



Better Things for Better Living . . . through Chemistry

SYNTHETIC

RUBBER

NEOPRENE  
HYPALON®  
VITON®  
ADIPRENE®

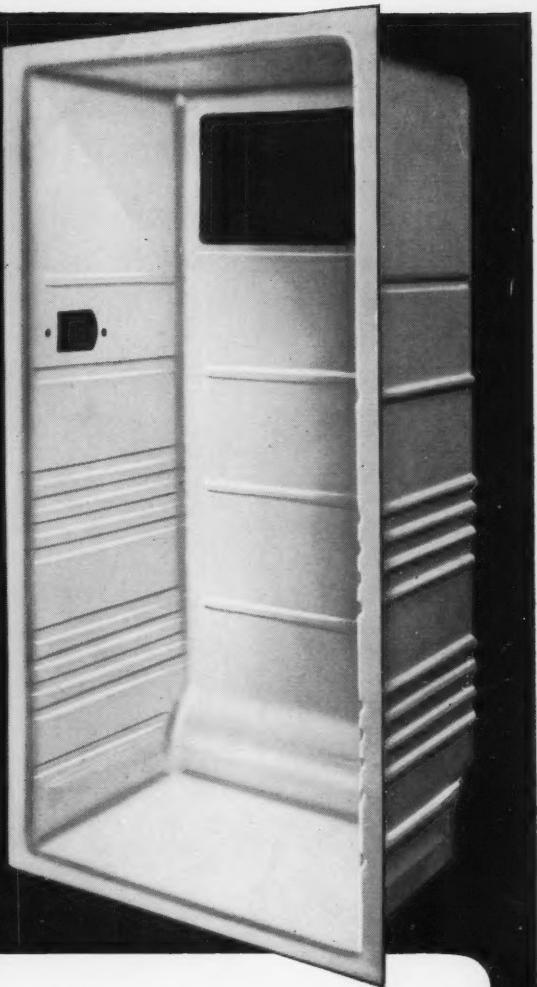
\*Registered Trademark of E. I. du Pont de Nemours Co. (Inc.)

A **GeMex** APPLICATION



## REFRIGERATOR FOOD COMPARTMENT

A significant  
advance in  
**VACUUM  
FORMING**  
technology



This new G.M. Plastic vacuum forming process was developed specifically for the production of seamless food compartments for domestic refrigerators. Great design flexibility makes it possible to produce special sizes and shapes for many different applications.

Advanced vacuum forming techniques allied with an ever expanding range of plastic materials result in better products, at lower costs, in your own industry.

G.M. Plastic Technical Representatives will be glad to call on you . . .



**G.M. PLASTIC CORPORATION**  
P.O. Box 548 GRANBY, P.Q. FRontenac 2-5457

For further information mark No. 128 on Readers' Service Card



## MICRO SWITCH Precision Switches



12MA1 Actuator



12MA5 Actuator

**Pushbutton actuators are versatile, low cost**

These actuators accept three families of basic pin plunger switches permitting their use in a wide range of applications. Two button sizes— $\frac{1}{2}$ " and 1"—and choice of red, green or black buttons give panel distinctiveness. Switch and actuator mounting hole arrangement permits use in panels from .060" to .312" thick, and simplifies button travel adjustment. Data Sheet 155.



### Sub-subminiature series switches

These remarkable switches combine smallest available size with "regular size" electrical capacity, operate dependably in temperatures from  $-65^{\circ}$  to  $+250^{\circ}$ F. Weight—1/28 oz. Qualifies as Military Standard Part Number MS24547-1. Rating: 5 amps., 230 vac; 7 amps. resistive, 28 vdc. Data Sheet 148.



LEAF ACTUATOR



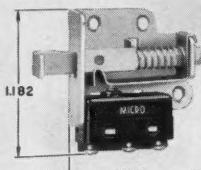
ROLLER LEAF ACTUATOR

Auxiliary actuators add to the versatility of application. Two are shown. Others are pivoted lever and pivoted roller lever. All are stainless steel.

**New subminiature "TM" toggle switch uses minimum panel space**



The 2TM1-T offers considerable reductions in space and weight in manual control of compact equipment. Weight— $4\frac{1}{2}$  grams. Only  $\frac{1}{2}$ " square at the base. Dependable operation from  $-65^{\circ}$  to  $+200^{\circ}$ F. Low circuit resistance. Rating: 7 amps. resistive, 28 vdc. DPDT. Data Sheet 158.



### New subminiature safety door interlock

The 17AC1-T cuts off power in equipment cabinets when a service door is opened. Manually pulling the rod actuator to maintained contact position closes circuit for checking. When door is next closed, switch returns to normal... resets itself to safety position. Dependable in temperatures from  $-65^{\circ}$  to  $+250^{\circ}$ F. SPDT. Data Sheet 159.

### "One-Shot" switches simplify circuit development

Time-consuming custom development of circuits is made unnecessary by "1PB600" Series "One-Shot" pushbutton switches. These switches produce one square wave pulse per operation. Pulse widths from 0.1 to 10.0 microseconds. Applications include computer and radar consoles, electronic test equipment, setting and resetting flip-flops, and reflected pulse systems. Data Sheet 150.



## Selections from a line large enough to solve almost any switching problem

MICRO SWITCH makes many hundreds of switches and switch devices especially useful to the electronic designer. Here are a few of them, in a considerable range of sizes, electrical capacities, and functions. MICRO SWITCH development engineers are constantly widening the choice with new switches and devices to meet new requirements. The designer can go ahead with a switching arrangement he has in mind with confidence that MICRO SWITCH can supply his need.

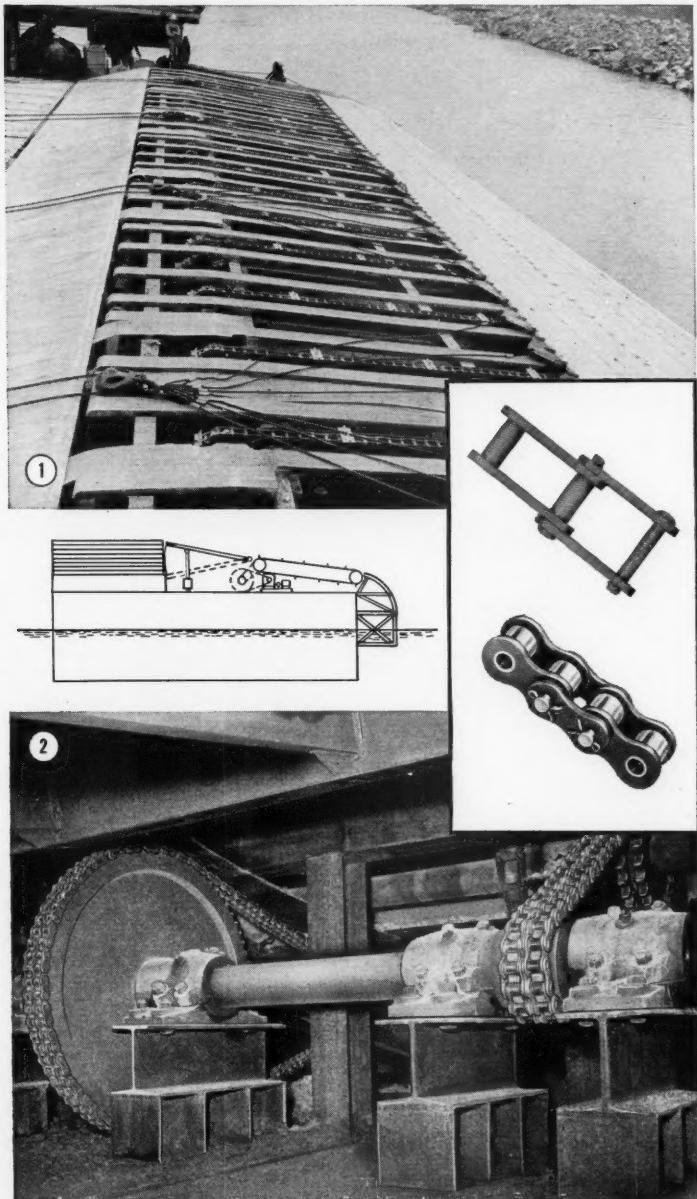
Engineering assistance in switch applications is available without obligation from your nearest Honeywell office, or write Honeywell Controls Limited, *Precision Components Division*, Toronto 17, Ont.



**Honeywell**  
MICRO SWITCH Precision Switches

For further information mark No. 131 on Readers' Service Card

# In chain— get choice . . . not chance!



**LINK-BELT's complete line gives positive answers to specific design questions**

Usual tunnel construction requires that a shaft be bored and lined through bedrock. The Deas Island Tunnel, however, is made up of precast tunnel elements sunk into a trench dredged into the bottom of the Fraser River. This unique method called for the tunnel to be covered with concrete erosion mats and a layer of rock fill. It also required a solution to the problem of laying these mats. Kiewit-Raymond and B. C. Bridge & Dredging Co., Ltd. couldn't take a chance. They called on Link-Belt.

## A CHAIN REACTION

Link-Belt engineers responded with SS-102B Class bushed chain. Mats are piled on one side of a barge, pulled off the pile over an adjustable ramp onto the chain conveyor. They go over the side and are laid at approaches to the tunnel 38 feet below. Power transmission is supplied by Link-Belt Roller Chain Drives.

## A COMPLETE LINE

Chances are, Link-Belt offers a chain with the exact characteristics demanded by your job. No other single source can equal Link-Belt's broad range of cast, combination, forged and fabricated types plus roller and silent chain.

You can be sure that Link-Belt chain is made to the highest standards. Link-Belt's modern plant facilities assure greater accuracy of manufacture. Exact control of materials and processes give increased uniformity . . . longer chain life.

You can get further facts from your Link-Belt office. Put in a call today.

① **MAT OVERBOARD**—Conveyor consisting of 16 strands of Link-Belt SS-102B bushed chain with special spur attachments makes this method possible. SS Class bushed chain is also ideal for heavy-duty elevator service.

② **DEPENDABLE POWER**—Link-Belt RC 120 roller chain (at left) drives countershaft. Link-Belt RC 160 roller chain drives head-shaft at right. Available in single and multiple widths,  $\frac{1}{4}$  to 3-in. pitch.

# LINK-BELT

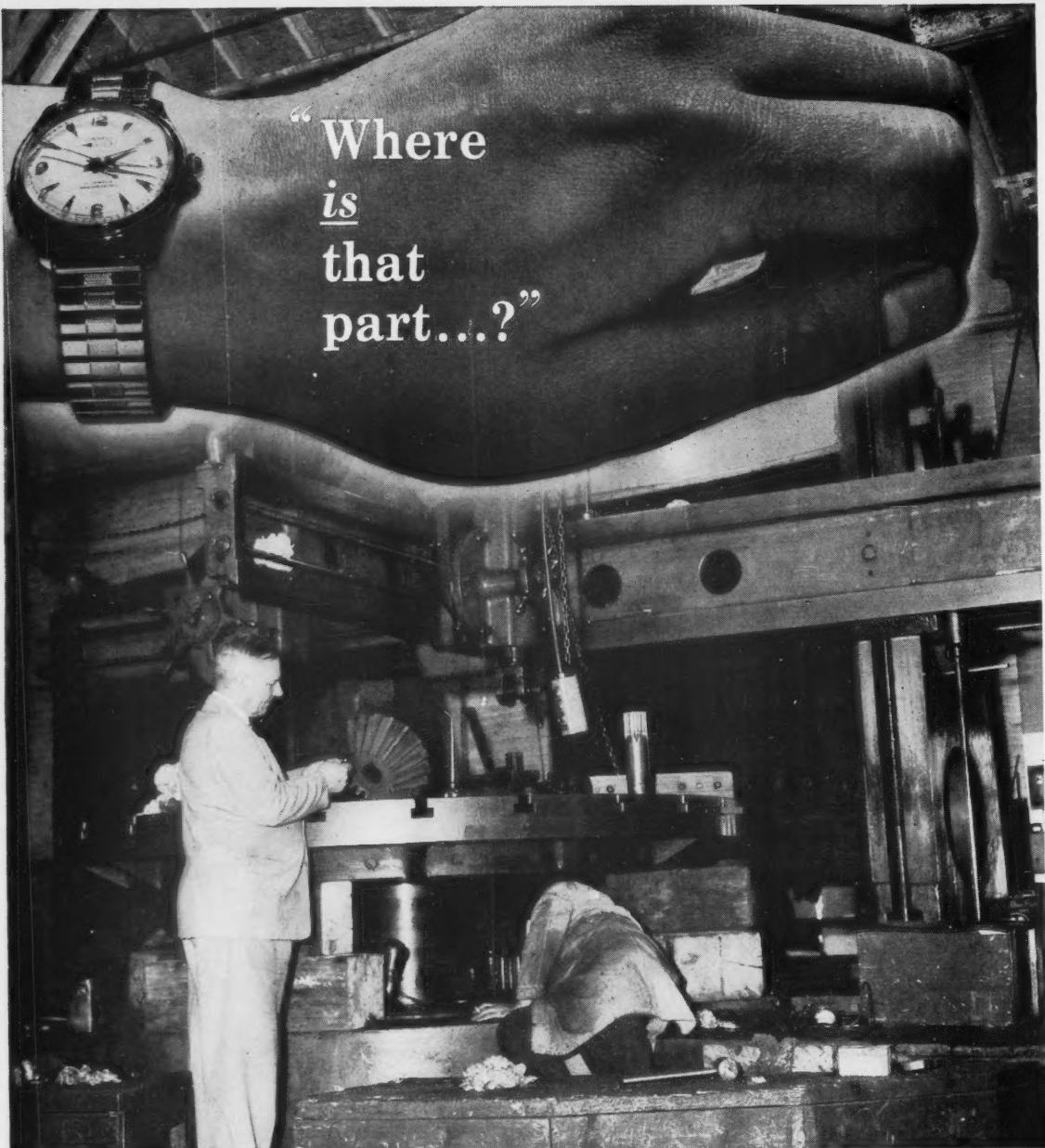


CHAINS AND SPROCKETS



**LINK-BELT LIMITED:** Scarborough Plant, General Offices and District Sales—Dept. 560-DE, 1960 Eglinton Avenue E., Scarborough, Ont., Station H, Toronto 13  
• Eastern Avenue Plant and Warehouse—731 Eastern Avenue, Toronto 8 • District Sales Offices and Warehouses—Montreal 15: 945 Beaumont Avenue  
• Vancouver 12: 2550 Boundary Road • Winnipeg 10: 1315 Portage Avenue • Swastika, Ont.: 8 Boisvert Street • Halifax: Austen Bros. Ltd., 118 Hollis Street • District Sales Offices—Edmonton: 10019—103rd Street • Hamilton: 605 James Street, N. • Sydney: Austen Bros. Ltd., 361 George Street  
• Foundry at Elmira, Ont., 19 Church Street, E. 15,071

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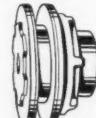


## *how to stop footing the bill for unnecessary downtime*

Easily done when you rely on a United Steel "quick-service" warehouse for no-delay delivery of the replacement Power Transmission equipment you need.

We have huge stocks of standard power transmission equipment, ready to fill your order within minutes of your request. You save on inventory expense *without* sacrificing availability of the units you need for emergency replacement.

We welcome the opportunity to prove that it is "the fastest power transmission equipment service available". Why not make a note of the telephone numbers shown here and stop footing the bill for unnecessary downtime when the next emergency arises?



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60-81



**United Steel**  
CORPORATION LIMITED

TORONTO — RO. 2-8242   MONTREAL — WE. 3-4277  
KIRKLAND LAKE — 1017   SUDBURY — OS. 4-3053

# THIS IS GLASS

A BULLETIN OF PRACTICAL NEW IDEAS



FROM CORNING



## THE UNEARTHLY USE OF GLASS

Some day the stellar equivalent of an archeologist will ferret his way through space, collecting debris from the sundry objects we are thrusting out past the pale of gravitation.

That man is going to find a lot of glass.

Next to the metals, glass is the basic material for space work. Big claim? Big fact.

You can blast glass out at the stars, shine the sun at it full open, slide it into the cold void of the earth's shadow, plummet it back into the searing atmosphere, recover it from the bobbing waves. And, all the time, glass will hold to its integrity, its properties, its dimensions.

You can design glass into a piece of space hardware; you can only know the beauty of this if you have had to design around some other material that has interesting properties but is hard to work.

Glass has hardly any design limitations. We can mold it, blow it, fuse it, press and roll it, etch it, temper it, or try any of a dozen other controlled techniques to meet exactly the shape you want, exactly the size you want, exactly the exactness you want.

We have some 60,000 glass formulae to select from, so matching your specs on properties is a snap.

We have combinations of glasses that transmit or attenuate all of the visible light spectrum and most of the infrared and ultraviolet as well.

We can take a mass of glass yards thick and make it as transparent as the objective lens on a microscope, as surface perfect as the facet on a ten-carat diamond.

Big claims? Big facts. Radomes, windows for space capsules, giant mirrors for balloon-floated telescopes, electronic components, macro and micro in size . . . these are just a few of the things you can do with glass . . . and, with all that, you haven't begun to tap the possibilities of glass in space.

We have two brochures that tell about these properties and design potentials: *This Is Glass* treats of the material itself. IZ-1 discusses the applications. Check the coupon for copies.

## WE'LL GROW RED ROSES IN JUNE, JUST YOU AND I UP ON THE MOON

It goes without saying that you cannot grow terrestrial plants in a  $10^{-12}$  mm Hg atmosphere . . . but just how high does the pressure have to be to bring a plant to maturity? What about the effects of a lower gravity? What sort and how much light will you need to make a seedling stir? How about temperature?

Republic Aviation is engaged in some research of this sort, which will form a sort of almanac for the lunar farmer.

We come into the picture with a vacuum-tight greenhouse, often referred to as a PYREX brand bell jar. Besides serving as the perfect lunar greenhouse, it recommends itself on a weight basis.



You might remember this "Moon Garden" if the time comes when you want an environment you can play with and observe. Many are the people using our bell jars for high vacuum and high pressure work, for the creation of an inert gas atmosphere; in short, for any work where you want to free yourself from the deficiencies of the terrestrial atmosphere.

## HOW TO SEEK OUT AND HIT A MELTING ICE CREAM CONE IN THE MIDDLE OF ALASKA

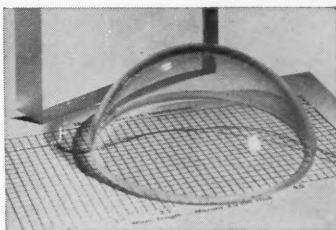
We make the glass that goes into the domes that transmit the infrared waves that activate the cunning minds of the heat-seeking missiles that go pow.

Today we make a better IR transmitting glass than ever before. We call it Code 9752.

A 2mm thickness of this glass will transmit 77% at the 4.0 micron wave length and 38% at 5.5 microns. Not bad.

At 600°C there is no transmission loss whatsoever at 4.0 microns, only 13% at the 5.5 micron wave length.

Our research people say the glass has



"good" electrical properties, "excellent" weathering characteristics. Our research people are known as conservatives.

In a durability test, we found that there was no appreciable transmittance loss in 21 days at 95% RH with temperature cycling from 25°C to 65°C twice a day.

Using standard techniques, we can mass produce this glass in a variety of hollow shapes and give it an optical finish. We can press 7" domes automatically and make larger sizes to order. Flat pieces, 12" square and  $\frac{1}{2}$ " thick, are being used in the instrumentation field for such devices as Schmidt corrector plates.

The coupon offers a bulletin on this and two other Corning IR transmitting glasses.



CORNING MEANS RESEARCH IN GLASS

**CORNING GLASS WORKS**, 39 Crystal St., Corning, N.Y.

- This Is Glass
- IZ-1
- IR transmitting glasses

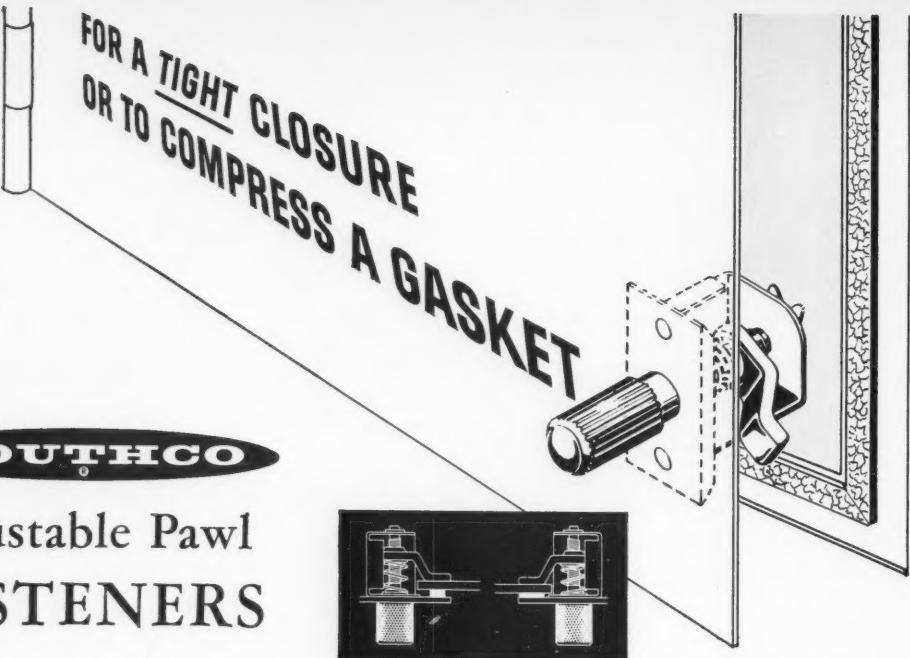
Name..... Title.....

Company.....

Street.....

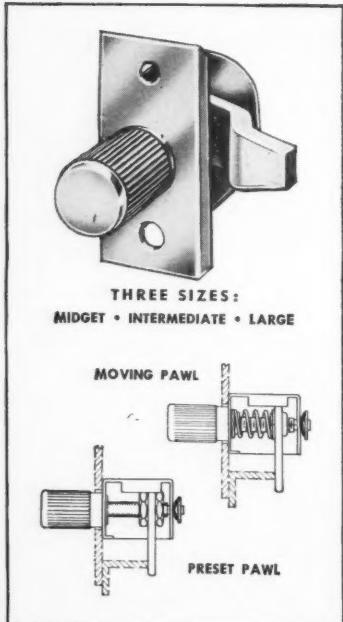
City..... Zone..... Prov.....

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## Adjustable Pawl FASTENERS

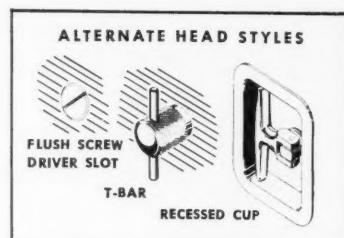
*1/4 turn closes—additional turning tightens*



Just slip the knob through a hole in the door (any door thickness—it doesn't matter). Fasten with two rivets, bolts, or welds. The Southco Adjustable Pawl Fastener will fit your door frame, even when material gauge varies between units.

Turn the knob. The first quarter turn latches the door. Now keep turning. You're pulling the door tightly against its frame. You can compress a gasket, form a dust or moisture seal, overcome vibration.

You'll save installation time and satisfy your customers with these rugged, attractive, pre-assembled fasteners. Ideal for heavy machines, electronic consoles, miniaturized units, cabinets, missiles, slide-mounted modules, etc.



**FREE!**  
**FASTENER**  
**HANDBOOK**



Send for your complete  
Southco Fastener Handbook,  
just printed.

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**METAL AND WOOD  
FASTENING DEVICES**  
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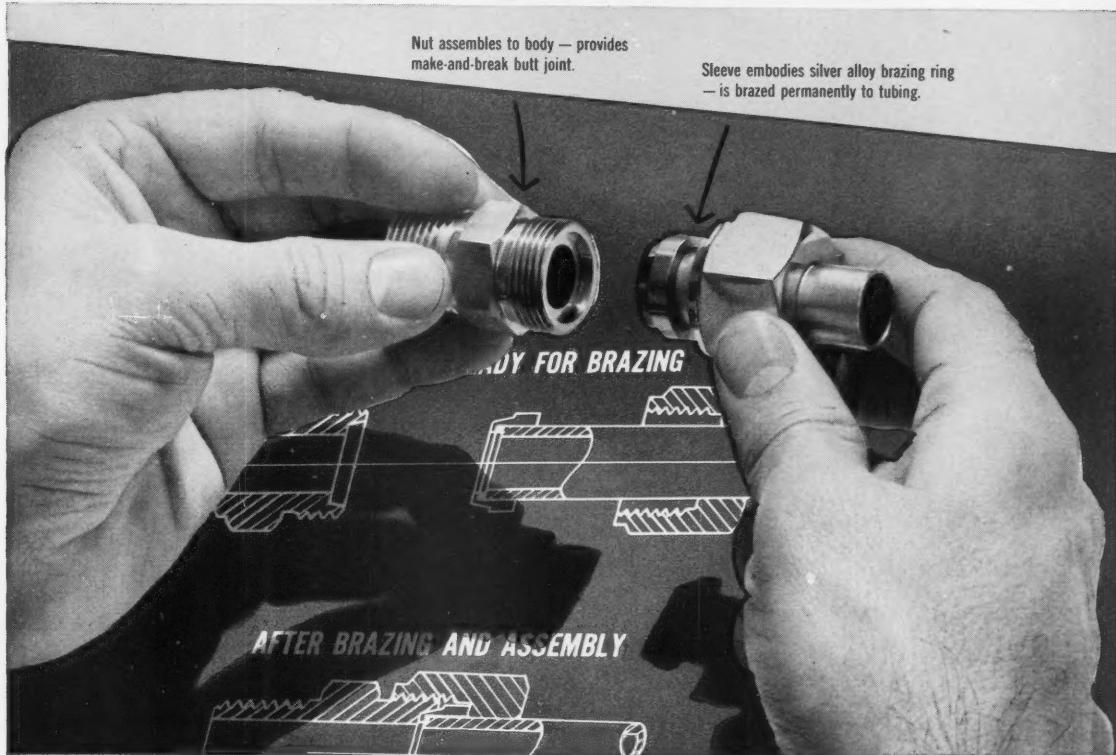
**SOUTHCO** **FASTENERS**  
**LION**

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# IMPERIAL

## Engineering and Data File



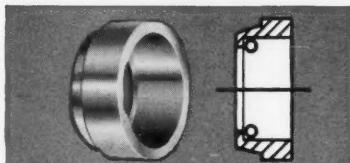
### NEW BRAZE-SEAL TUBE FITTING WITHSTANDS SUPER-PRESSESSES, HIGH TEMPERATURES . . . RETAINS MAKE-AND-BREAK CONVENIENCE

Until Imperial Braze-Seal came along, engineers could not specify an economical make-and-break fitting for tubing circuits involving super-presresses and high temperatures. Applications like these called for welded connections. But now Braze-Seal offers high reliability, even under extreme pressures. (See chart below.)

#### MAXIMUM DESIGN PRESSURES (PSI) FOR BRAZE-SEAL FITTINGS

| Tube<br>O.D. | 316<br>Stainless | Carbon<br>Steel |
|--------------|------------------|-----------------|
| 3/8"         | 64,000           | 48,000          |
| 1/2"         | 62,400           | 46,800          |
| 9/16"        | 61,600           |                 |
| 5/8"         | 61,600           | 46,200          |
| 3/4"         | 60,000           | 45,000          |
| 7/8"         | 56,000           | 42,000          |
| 1"           | 52,000           | 39,000          |
| 1-1/4"       | 48,000           | 36,000          |
| 1-1/2"       | 44,000           | 33,000          |

Application of the following safety factor is recommended:  
4 to 1, for sizes up to 3/8" O.D.; 6 to 1, for sizes 3/4" to 1 1/2" O.D.



This Braze-Seal Sleeve, containing a silver alloy brazing ring, is the key to the performance of the Braze-Seal Fitting. It assures a joint that will withstand these extreme pressures because it is permanently brazed to tubing. Yet the fitting provides the convenience of a make-and-break butt joint, as illustrated, and is extremely easy to assemble.

#### Reducing Sleeves Provide Versatility

Can be furnished to reduce any size Braze-Seal tube end to any specified tube size. Extremely convenient on tees, for example, where any size tubing can be connected to the same tee body.

Also, the same body may be used for making up flareless Hi-Seal fitting joints.

Imperial Braze-Seal Tube Fittings can be furnished in steel or stainless steel.

Check the outstanding features of Braze-Seal for yourself. Send for a sample fitting. See how Braze-Seal can help you solve the most difficult problems in super-pressure and high-temperature tube circuitry.

#### IT'S IN THE BOOK

Braze-Seal Fittings are covered in Imperial's new Hi-Seal Catalog—the most comprehensive coverage available on the subject of fittings, a hard-working handbook for engineers. Send for your copy today.



**IMPERIAL BRASS MFG. CO. (Canada) Limited**  
Dept. DE-50

18 Hook Avenue, Toronto, Ontario 8-60



## Meet a specialist...

He's a Dominion Fasteners sales engineer, and he specializes in saving Canadian manufacturers *time* and *money*. Thoroughly trained and experienced in all fastening procedures, he can quickly analyze your product, showing you where Speed Nuts can cut product assembly time, lower production cost, and actually improve your product.

There are over 8,000 different sizes and types of Speed Nuts in use today. One of these will probably be suitable for your operation. If not, the designers at Dominion Fasteners can develop a fastener to meet your specific requirements.

Because you're a manufacturing "specialist", you'll want the complete story about Speed Nuts and savings.

**DOMINION FASTENERS**

**Speed Nuts®**

Exclusive TINNERMAN Canadian Licensee

33-601

**DOMINION FASTENERS LIMITED, Dept. A62**  
HAMILTON, ONT. Sales Branches: Toronto, Montreal  
*a Gen. A. Tinnerman corporation*

Rush me complete information on how Speed Nuts can save me time and money, and make my product more competitive.

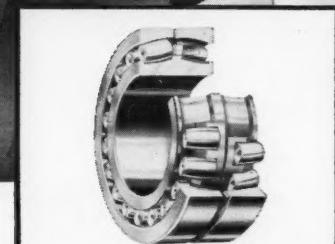
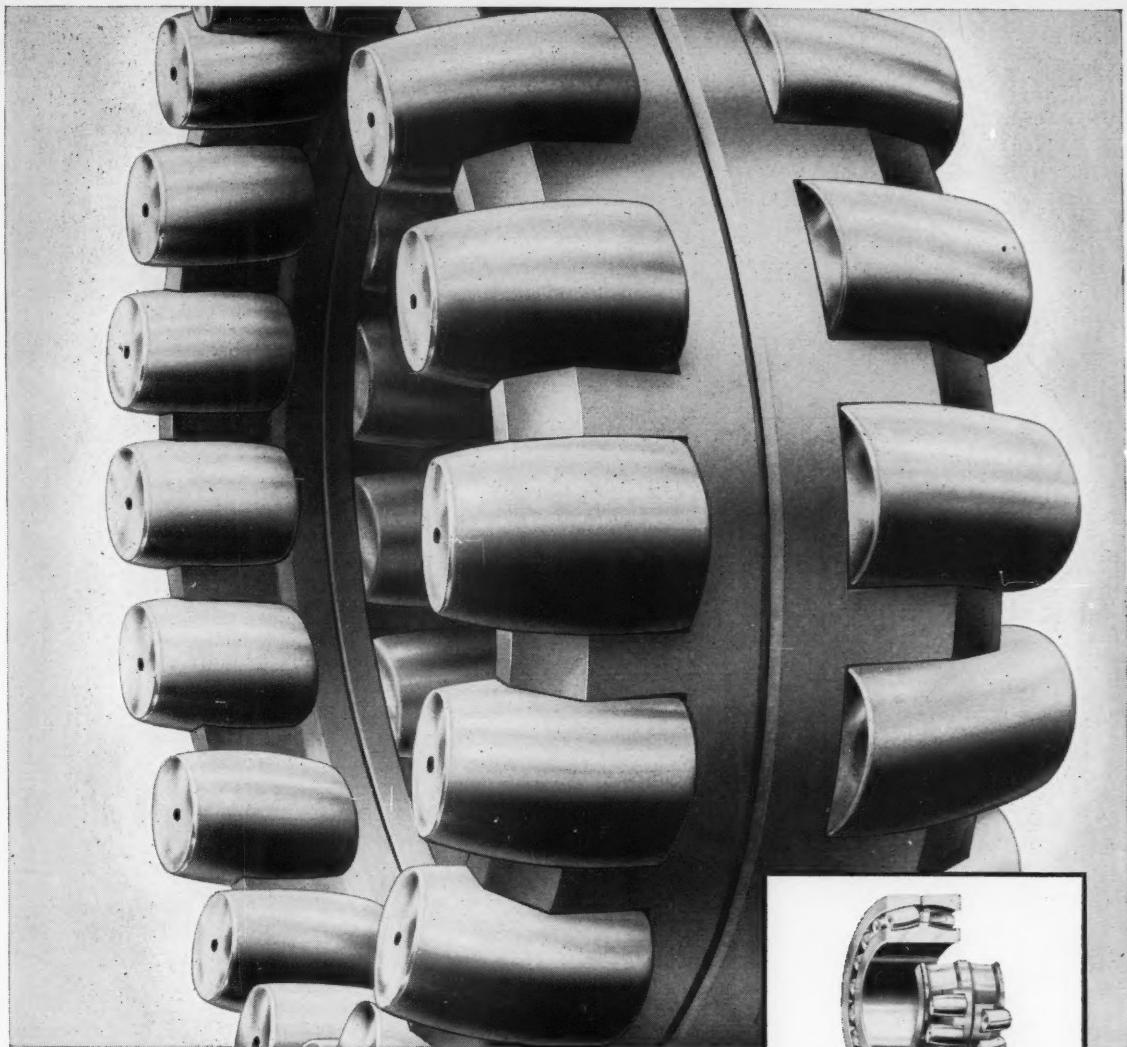
NAME \_\_\_\_\_

COMPANY \_\_\_\_\_

ADDRESS \_\_\_\_\_

WE MANUFACTURE \_\_\_\_\_

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## "Caged" for Longer Life!

The two land-riding cages in Torrington Spherical Roller Bearings assure proper roller spacing and guidance, even under rugged conditions of shock load and sustained high speeds. These fully machined cast bronze cages operate independently. Their design eliminates drag on rollers. These high-strength cages help bearings give longer life by providing low friction, smooth running and cool operation. Highly effective and generous lubrication of all contact surfaces is achieved with the open-end cage design.

The result: Torrington Spherical Roller Bearings are built to give extra years of unmatched service life in heavy-duty applications. Torrington's long experience in design, engineering and manufacture of every basic type of anti-friction bearing provides the finest spherical roller bearings available. You'll find it pays to standardize on Torrington.

### Superior design features of TORRINGTON SPHERICAL ROLLER BEARINGS

- integral guide flange for roller stability
- asymmetrical rollers seek flange for positive guidance
- electronically matched rollers
- size-stabilized races
- fully machined land-riding bronze cages
- controlled internal clearances
- even load distribution
- inherent self-alignment
- long service life

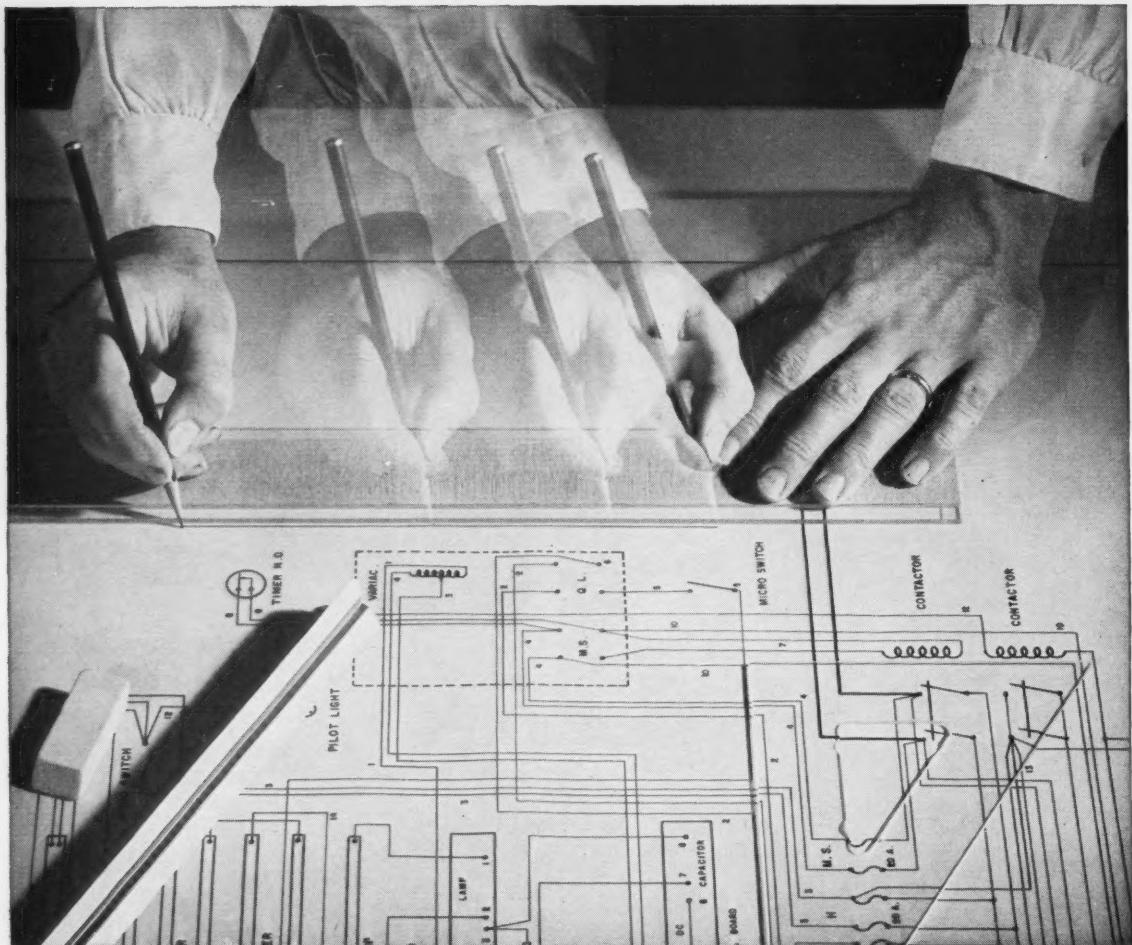
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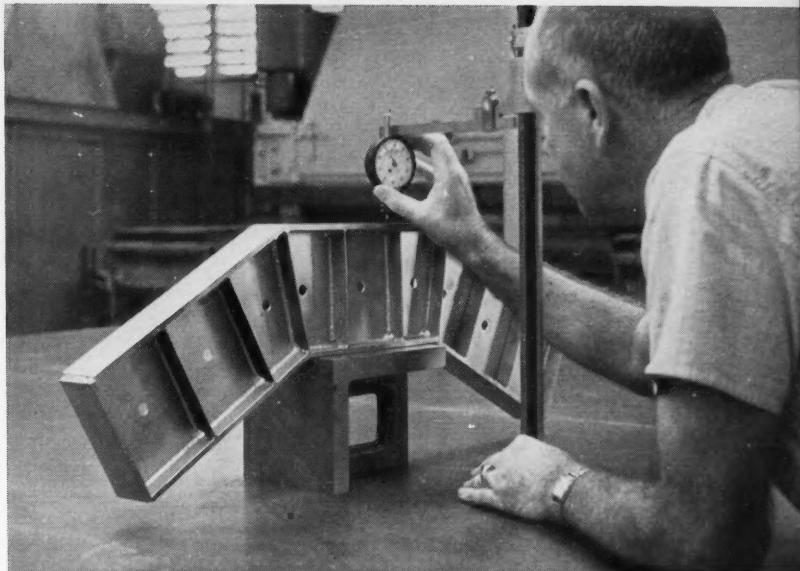
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## Design Engineering

The trend to the use of stainless steel in aircraft marks another stage in the battle between aluminum and steel for this segment of the market. Read what our interviewer found out when he talked to engineers A. C. Newman, T. E. Austin, L. B. Clayton, and W. A. Reinsch, of North American Aviation, Inc., designers of the B-70 bomber.



*1. An inspector checks stainless steel weldment for dimensional accuracy. Many weld configurations for aircraft are complex with high strength required.*

# The growing use of stainless steel in aerospace

## Present day use of stainless in aircraft presages similar use in tomorrow's commercial craft

QUESTION: *Would you say that the B-70 will utilize more stainless steel than any aircraft or bomber in the past?*

ANSWER: This is true. The bombers in the past have been primarily aluminum aircraft. In fact, I believe they all have, the B-58 included. We're in a new temperature range now where aluminum is out of the question.

QUESTION: *What temperature ranges are these?*

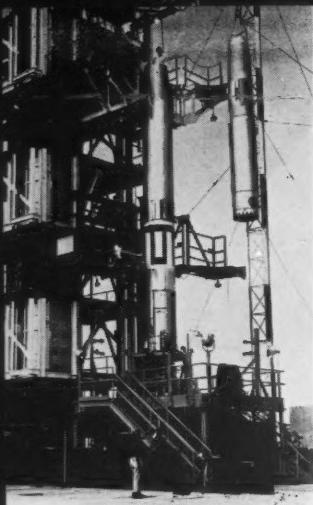
ANSWER: They vary considerably over the airplane, so let's say they can be up to 1,200 degrees, which is not uncommon in some areas of today's aircraft.

QUESTION: *Is stainless honeycomb structure used, and if so, why on the B-70?*

ANSWER: Due to the high density of steels and the lower load requirements in terms of density, you get into certain thicknesses and you have to go to some means of stabilizing a material to get it into an efficient structural range. This is what forces us into a sandwich-type structure, and a honeycomb sandwich is used on the B-70.

QUESTION: *Does the increased use of stainless in the B-70 indicate a trend toward more stainless steel in future aircraft?*

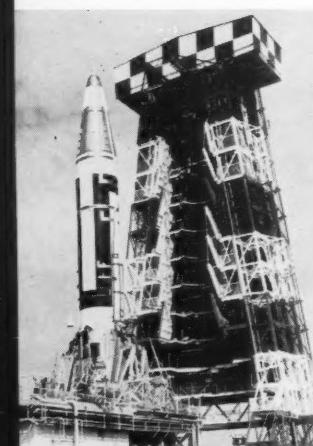
ANSWER: Not entirely. It's hard to generalize. Beryllium is coming into the picture and it will be quite a strong contender over, say, a thousand degrees. At the present time, though, stainless looks like it's going to be the clincher for the immediate business.



2. Atlas missile being assembled.



3. Installing stainless on afterburner of jet engine.



4. Missile positioned on pad ready for firing.

QUESTION: *Will, perhaps, the next family of commercial aircraft use far less aluminum and more stainless steel?*

ANSWER: Yes, the aircraft of the next generation will probably be stainless steel. The usage in the components will be, let's say, primarily stainless steel, but I feel the number of units that are going to be produced in terms of today's production of, say aluminum air-type aircraft, is going to be reduced because of the economy factor.

QUESTION: *Can you say anything about the type of stainless steel used in the planes. Is it a priority grade or is it a standard AISI grade?*

ANSWER: The types used in the sandwich and also in the sheet metal construction are the austenitic hardenable stainless steels for the most part. The greatest number of pounds of tonnage will be in those grades where strength piles up around above 200,000 psi. They've been chosen for their strength and — for sandwich construction, of course, corrosion resistance is necessary, since no corrosion protection can be afforded inside a sandwich-type construction very easily, at least. So although there are steels that have higher strengths, this corrosion resistance characteristic is important for sandwich.

QUESTION: *We have taken considerable interest in the use of thin gauge stainless steel in the Atlas, ICBM airframe. Convair has mentioned that there are new welding techniques used and that the gauge is quite thin, so that the vehicle is literally a stainless steel balloon, so to speak. Are thinner gauges used in the case of the B-70? Are new welding techniques employed?*

ANSWER: By comparison, here again alloy choice will depend upon the method of fabrication. Whereas, the Atlas is a resistance-welded structure — they can use a different type of material than we can for, say, sandwich or welded sheet metal structure. So where they're using the hard-rolled 300 series materials, we're using the heat treatable types which are heat-treated along with the brazing sequence in many cases for all the sandwich. I might say that sheet thicknesses down to around six thousandths are required for our applications, and they range upward in the general sheet thickness ranges. We're also in the foil thicknesses down to about one thousandths thick. In all these products, when we talk about high density and particularly gauge, tolerance becomes a real important issue on total weight. So that thickness isn't any more important, or significant, than is the tolerance that goes with it. So here is where the American Iron & Steel Institute would take a real interest in this product. Before anyone wants to offer a product, they also have to meet these thickness and tolerance requirements, or there must be a way to reach that after the product's rolled — one or the other.

QUESTION: *Do these new applications put a strain on the loose commercial tolerances, and also width capacities, such as width capacities of 100-inch or so in the present rolling mills?*

ANSWER: Right now it's quite common in the industry to talk about one half of AISI tolerances, and the mills are quite capable of producing this without a premium cost. This gets us started, but after this we have to go for tolerances of plus or minus one thousandths, so that brings us down to something quite a bit less than one half of the standard AISI tolerance already. This is all in the interest of weight, I might point out. We require widths up to 12 feet wide. We're now able to get 36, and 48-inch wide will be available shortly. So from 48 inches to 12 feet, represents quite a change in width requirements.

QUESTION: *So what's the answer — a giant new family of Zendzimir mills?*

ANSWER: This has been proposed as a possibility which sounds like a good one if the tolerances can be made. The other one is to weld narrow sheets together in multiples until you achieve your 12-foot width. This is the matter of economics again. The time element for welding enters into the economic picture. Close tolerances don't serve too good a purpose if we have to do something anyway, to get tolerances. There isn't too much of a point to make precision rolling equipment to get a close tolerance, which will be ground anyway. There must be a realistic standpoint.

QUESTION: *Is there anything else that you would want to say on the B-70?*

ANSWER: I might say the types of materials we are using require com-

plicated processing. The heat treatment we're using has to be compatible with our brazing cycle, so these materials have very specialized requirements which are way over and above what we have worked to in the past. They're not independent variables; they have to be worked in with our fabrication processes. This is making a very interesting time for us in using these materials and in considering any new materials that the industry would offer. We have to be able to process these parts and get aerodynamic surfaces after heat treatment and any other processing, of about two thousandths of an inch, which makes heat-treat distortion and other processing variables very critical. This requires very tight controls. In developing materials for this type of use, all these things have to be considered.

**QUESTION:** *What are the processes?*

**ANSWER:** These are principally welding. We are using a lot more welding in our fabrication than we ever have before, so brazing and welding has come into a new area here.

**QUESTION:** *Do you taper any of the skins?*

**ANSWER:** A great many will require tapering.

**QUESTION:** *How many?*

**ANSWER:** One of our latest developments in obtaining tapers, both single tapers, and multiple tapers, was by belt machining, simply a sandpapering operation; another way is by chemical milling, by going through a solution at variable rates. So we've just about gotten out of the milling operation as such because of the close tolerance required. They can't stand the tolerance that we now have with our mill aluminum skins. So our sources of tapers again are belt machining and chemical milling.

**QUESTION:** *How about extrusions; are there any stainless steel extrusions in the B-70?*

**ANSWER:** I would say we'd like to have extrusions.

**QUESTION:** *But the tolerance problem is ever-present?*

**ANSWER:** No, it's a little different than that. To have a successful extrusion, the only point is to get a shape you want or to improve mechanical properties. Some of these materials, apparently in the extrusion range, have a hot, short characteristic and you get surface tearing or bad surface as well as poor tolerance from the die wash, the temperatures and the abrasiveness of the material. You get a lot of die wash — so tolerances are hard to hold, and the hot shortness might give surface tearing. So if you can't get the tolerances and the surface you want, extrusion starts to lose a lot of its appeal right from the beginning. A second point is: if you can improve the mechanical processes, then some of these other things might be worth living with or trying to overcome. The extrusion process will improve the properties over a bar alloy, for example, so extrusion in that sense might pay off very handsomely.

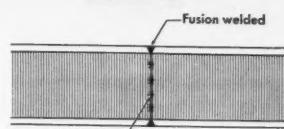
**QUESTION:** *Is there more use of stainless steel extrusion in the B-70 than in previous bombers and fighters?*

**ANSWER:** I would say it's a difference from nothing to a substantial amount.

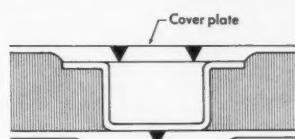
**QUESTION:** *And forging?*

**ANSWER:** Here again, these are low in some areas, but with the use of steels we're not entirely tied in to forging and casting necessarily. The fact that we can weld steels and heat treat them, makes it possible to go along the lines of weld, which are entirely new. We used it in the B-52. There's a large weldment in that. In the B-58 we have some weldments. So let's say the forging requirement, as we would think of it in terms of aluminum, like large massive forged spars, bulkheads, and so forth, isn't really a fixed requirement. However, if we could get the large forgings economically with the basic material tolerances and with the needed strength there would be a slight advantage over the weldments. Our weld assemblies, even with subsequent heat treat, suffer a strength reduction across the weld. In the case of the castings so far the casting properties or strength values with castings haven't come up to what they should be from a weight standpoint, so weight being all-important, we just can't afford to go the casting route.

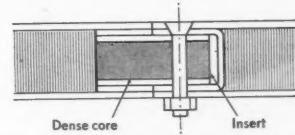
## TYPICAL PANEL JOINTS



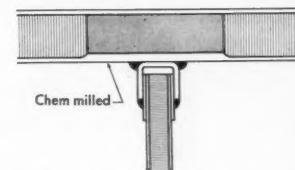
1. Ideal mid-panel joint, welded.



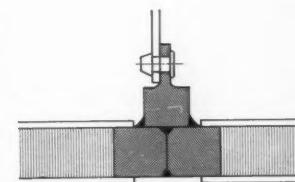
2. Joint—welded from one side.



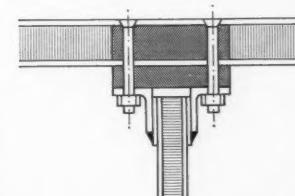
3. Mechanical mid-panel joint.



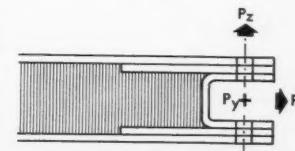
4. Panel—honeycomb sandwich.



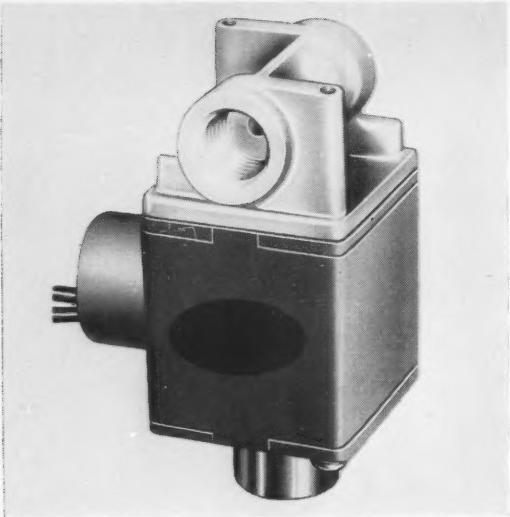
5. Simplest spar-panel intersect.



6. Mechanical spar-panel joint.



7. U-channel edge member load.



## How to specify solenoid valve capacity

**Specifications can be made in  
one of three ways—take your choice**

Furnishing a design engineer with the best possible solenoid valve for his application can present severe difficulties to a valve manufacturer. The major reason for such difficulties normally result from an insufficient and incomplete specification of what the valve must do with what media under what conditions and for how long. Overlooking any one factor can result in either proposing a valve which more than meets the requirements of the application or on the other hand does not meet some of them with—in both cases—consequent losses of efficiency, time and money. Thousands of valves can be shipped before it becomes apparent that the valve was over-specified or fails to meet a tight specification.

Possibly one of the most important parameters affecting the proper selection of a solenoid valve is that of capacity. An undersized valve will fail in operation; an oversized valve will be uneconomic.

The desired capacity must be specified—flow versus pressure drop—for each flow path in the valve. Capacity can be specified in one of three ways.

### Maximum allowable drop

Maximum allowable pressure drop at a given flow. Pressure drop is usually specified in pounds per square inch but may be given in other convenient units such as inches of mercury or feet of water. Flow is usually specified as gallons per minute; pounds per second, minutes or hours; or cubic feet per minute. You can determine pressure drop either from your process requirement—the amount of fluid to be delivered in a unit of time—for instance, 6 ounces of Coca-Cola in six seconds in a vending machine application, or from the work requirement—the amount of fluid required to operate a fluid motor cylinder—for instance, 120 cubic inches a minute for a cylinder with two cubic inch displacement operating sixty times a minute.

Pressure drop through the valve at rated flow is a measure of valve efficiency. Design engineers naturally like to have zero pressure drop; however, zero pressure drop leads to large envelopes, large solenoids with high current drain and high cost. Consequently, although an essentially zero pressure drop—no larger than in a length of line equal to valve length—can be obtained in straight-through types of valves such as Valcor shear seal valves, it is to your advantage to allow as much pressure drop as possible. An allowable pressure drop of 1 to 5 percent of the upstream pressure minimizes valve cost.

### Minimum pressure required

You can specify pressure drop by determining the minimum pressure available at the power source and the allowable minimum pressure required at the discharge or power use point. Then determine from the system or, on the other hand, design the system such that the difference in the above two pressures is not exceeded by the summation of the pressure drops in the lines including all components between the pressure source and the point of use. From this analysis you can determine or set the maximum permissible pressure drop at rated flow for each component (see Figs. 1 and 3).

When specifying gas flow from Fig. 3, the parameter  $\sigma \Delta P$  in psi is defined as:

$$\sigma = [(P_z + P_y)/2] [1/P_o] [T_o/T_z]$$

$$\Delta P = P_z - P_y$$

$$\sigma \Delta P = 17.6 (P_z^2 P_y^2)/T_z$$

Where  $P_z$  is the upstream pressure (psia)  
 $P_y$  is the downstream pressure (psia)

$P_o = 14.7$ , standard atmospheric pressure (psi)

$T_o = (460 + 60F) = 520R$  corresponding to  $60F$

$T_z$  = the upstream absolute temperature in degrees Rankine or  $(460 + ^\circ F)$

$\Delta P = P_z - P_y$ , the pressure drop in psi

$\sigma \Delta P$  is a valid parameter for universal use because

the mass flow of a gas through a nozzle or orifice is directly related to the square root of the gas density and the pressure drop. The "σ" term basically corrects the pressure drop at the actual conditions to the pressure drop that would occur if the gas density was the density at standard conditions. This assumption is valid for any gas which reasonably follows ideal gas laws. It has the advantage of simpleness, and allows the comparison of tests at different temperatures and pressure conditions. As far as we know this method originated with the North American Aviation Corporation.

### Coefficient method

Specification of valve size by specifying a valve flow coefficient,  $C_v$ , is widely used and may in time become universally accepted practice.  $C_v$  provides a figure of merit by which one valve can be compared with another at a glance. The figure of merit appears in the following equation and can be calculated from them.

For liquids

$$GPM = C_v(\Delta P/G)^{\frac{1}{2}}$$

For gas, critical flow,  $\Delta P > \frac{1}{2}P_x$

$$Q = 695 C_v P_x / H^{\frac{1}{2}}$$

For gas, noncritical flow,  $\Delta P < \frac{1}{2}P_x$

$$Q = 1360 C_v [(\Delta P P_x / H)]^{\frac{1}{2}}$$

For steam, noncritical flow,  $\Delta P < \frac{1}{2}P_x$

$$W = 3 C_v K (\Delta P P_y)^{\frac{1}{2}}$$

For steam, critical flow,  $\Delta P > \frac{1}{2}P_x$

$$W = 1.5 C_v K P_x$$

Where

$$H = G(460 + F)$$

$GPM$  = gallons/min (liquid)

$Q$  = cubic ft/hr at 68°F and 14.7 psia (gas)

$W$  = lbs/hr (steam)

$P$  = pressure drop in psi

$G$  = specific gravity (dry air or water = 1)

$V$  = specific volume of inlet steam

$P_x$  = upstream pressure psia

$P_y$  = downstream pressure—psia

$F$  = temperature in degrees Fahrenheit

$K$  = coefficient for steam quality or degree of superheat

= 1 for dry saturated steam

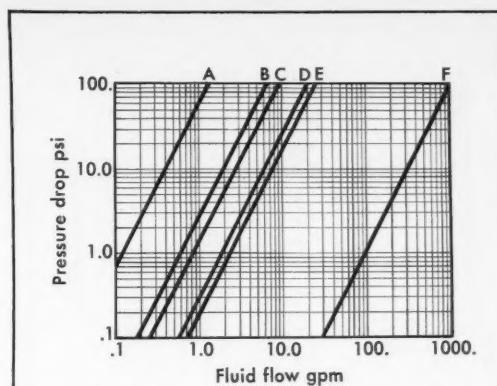
= 1 - moisture content in percent (for wet steam)

=  $(1 + 0.000655)^{\frac{1}{2}}$  (for superheated steam where  $S = F$  superheat)

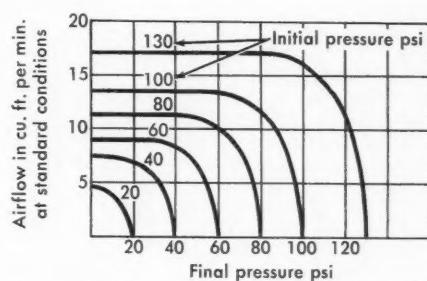
Thus a valve with a  $C_v$  of 1 means that the valve will pass one gallon per minute of water at a 1 psi pressure drop or 598 cubic feet per hour of air at standard conditions with a pressure drop of 1 psi and an upstream pressure of 100 psia and a temperature of 60°F; or 30 pounds per hour of saturated steam at an upstream pressure of 100 psia and a pressure drop of 1 psia.

### Equivalent orifice

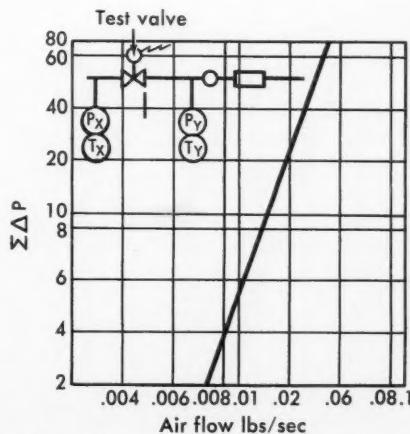
Sometimes valve capacity is specified as the equivalent of a standard sharp edged orifice, that is, its flow characteristic is equal to or better than a sharp edged orifice of specified diameter. \*



1. Manufacturers normally illustrate the flow characteristics of their valves by plotting pressure drop in psi vs fluid flow in gallons per minute. Note that on a logarithmic plot all curves for liquids are straight lines of equal slope; thus finding one point establishes the curve.



2. One method used to specify flow characteristics of gases. When air flow is plotted against final pressure, the family of curves show how the specific volume of the gas varies with the pressure and temperature.



3. Second method to specify gas flow characteristics. This allows comparison of tests run at different temperature and pressure conditions.



## Canada's first urban passenger bus

**Gord Duffy**, Montreal editor



1. The straight doors do not conform to the contours of the bus — nor of the model. Only a small portion of the door protrudes from the bus body in open position.

A dozen years of wishful thinking and two more years of concentrated development work by a team of Canadian Car Co. Ltd. engineers has resulted in Canada's first urban bus design. Scores of new features have been built into these completely new 43- and 51-passenger diesels, many of them as a direct result of the extremes in Canadian climate and road conditions.

One significant outcome of the design team's efforts was an illustration during test runs that the new buses can save up to 11 percent in operating costs over their older counterparts.

Although the 13 percent increase in horsepower was a factor, the development group say the sum of the new design features results in a bus that will be lighter than previous models — and together result in an improved power-weight ratio.

### Uncluttered body styling

The simple, uncluttered body styling houses a myriad of changes all designed to contribute to the overall saving. A new engine in a new rear end location means savings in fuel, weight and tire wear. New glider doors, larger windows, anti-corrosive materials and a



2. Seating has been laid out to follow the current trend—fewer seats and more space for standees.

paint-free interior were built into the new bus, along with a heating system that keeps even the passenger windows clear down to -20 F.

When Can-Car decided two years ago that it must satisfy the operator's demand for a new bus with more eye-appeal and comfort, the engineering and sales divisions pooled their resources.

Their basic objective: to come up with a new design that would lick the problems posed by the Canadian winter; and a design that would match the added features of the more ornate U. S. competition while providing an edge over this competition in the fields of initial capital cost, maintenance and operating expenses.

Only direct outside help came from the customers themselves. For two weeks at the Fort William, Ont. plant the sales and engineering staff discussed their preliminary design ideas with these customers. They were the key users of the 4,259 Brill-type buses and trolley coaches produced by Can-Car in the 1946-59 period.

This session, coupled with a market survey of the members of the Canadian Transit Association, brought preliminary discussion to a head. The designers set their sights on a lighter bus with improved operation economy and ease of maintenance. They wanted a smart, simple design that would be attractive without being ornate, but could be dressed up with the addition of silver siding. They also wanted equal or better performance, air suspension and better heating, ventilating and defrosting systems.

Contemporary station wagon styling, in which length is emphasized by horizontal bands and overhang front and rear, was the basic premise on which the styling of the new buses was evolved.

The roof quarter-panel, windows, belt rail, side panels, rubbing strips and lower skirts all contribute to this effect. In this, the designers staked the hope that this over-all treatment of the sides gives a greater sense of speed than the other methods now in vogue, such as the sloping sash.

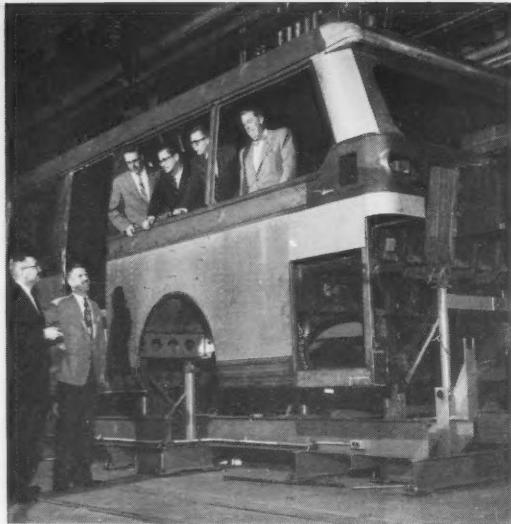
#### Attractive, functional and economical

Because of their relatively long life, the designers also wanted an attractive, functional and economical bus design that would stand up against future styling changes of competitors, but also provide the basis for a more glamorous optional model.

They feel the station wagon-inspired final design, with its straight-line classic shape in which there are no costly double curvature metal parts, achieves the simplicity essential to this necessarily complex set of requirements.

Constructed of high tensile-low alloy steel to reduce weight and corrosion, the body utilizes the stressed skin principle to carry loads. In areas of compound curvature extensive use is made of fibreglass-reinforced plastic. This includes step wells, wheel housings (which, in this bus, are non-structural), front and rear roof caps, rear engine door and the engine compartment undershells.

By moving the engine from its underfloor centre position to a rear transverse mounting, the centre under-frame sills were removed for a further weight saving. All loads from the suspension and power plant are transferred through the cross members to the side panels, which are the main load carrying members. The roof structure is not used to carry any of these loads directly.



3. The design team inspects one of the buses on the production line at the Lachine plant. Left to right: W. G. Chalmers, engineer in charge of automotive design; R. A. Evans; L. B. Walker; N. W. Kuster; C. J. Gidman; J. E. Rymes.

### **Passenger bus — Continued**

Although the body posts are a complex pressed steel shape, they are common in all locations in the body and eliminate nearly all non-standard sizes. The interior finish panels act in conjunction with the body posts and roof braces to provide the ductwork for the heating and ventilating system.

The new method of roof assembly uses a jig into which the quarter-panels, roof bows and braces are assembled. The roof bows are pulled down by pneumatic cylinders, the aluminum roof skin pulled taut fore and aft, and riveted to the quarter-panels.

The fibreglass front and rear roof caps are installed and the roof assembly is moved to another rotating jig where the braces are welded and riveted. Depending on the ceiling material the insulation, ceiling panels, lights and grab rails can be installed before the complete roof assembly is placed on the lower body just above the window line. This method of construction results in less riveting and fewer roof seams, extra protection against leakage.

#### **Concepts in glass**

The windows are mounted, with rubber extrusions, in an aluminum pan which is sealed and riveted on the outside of the body so that the windows can be removed without disturbing the sealing or the interior finish. These wider windows have a wide vision lower window with two sliding upper sections.

Double glazing is available to operators who experience temperatures below  $-20^{\circ}\text{F}$ . Double glazing is provided as standard on the destination sign boxes.

The two-piece (for economy or replacement) wrap-around windshield, the first to be used in a production city bus, is tilted inward from the bottom at an angle of 23 degrees.

Originally the designers wanted to slope the windshield outward from the bottom for styling reasons and

to minimize heat from the summer sun. But tests revealed that although it succeeded in solving the summer sun problem, it also reflected all the interior lighting at night, and seriously hampered the driver's visibility. The tests established the 23-degree slope inward from the bottom as the best compromise.

Glider doors with aluminum frames and four large windows were chosen over the conventional wooden folding type for many reasons. Not only are the gliding doors more attractive and provide better visibility for passengers, they have a smoother action and leave a larger (31 in.) door opening. The danger of trapping passengers' hands is minimized and the elimination of piano hinges reduces maintenance costs.

The straight doors do not conform to the contours of the bus. Only a small portion protrudes from the bus body in the open position, a protection factor, and they do not interfere with crowds of passengers. Dual stream entrance and exit doors may also be installed.

#### **No interior painting**

No paint is required on the bus interior. The panels below the windows and in the ceiling are high pressure laminate with high gloss finish, while the panels between the windows and heater duct covers are rigidized aluminum with natural finish. Kick panels at floor level and at the five-passenger seat are rigidized stainless steel.

Paneling at the front is vinyl-covered aluminum in matte finish to withstand wear and minimize glare. Stanchions and grab rails are aluminum alloy tubing mounted in satin finish chromium plated fittings. The linoleum floor covering is ribbed along the aisles.

The seating can be laid out to follow the current trend toward less seats, thus providing more spacious and comfortable seating during off-peak hours and more standee space when the bus is crowded. Single, rather than double, transverse seats can be used on the left side to accomplish this.

The seats use conventional tubular steel frames, but a new oval section tubing is used to give a smarter appearance without sacrificing strength. Seat cushions and backs are foam rubber upholstered in vinyl-coated fabrics and the backs, long a favorite spot for scratching initials, are protected with stainless steel panels.

#### **Temperature control a problem**

Control of air temperatures within the bus was a problem compounded by the Canadian climate, where it might be 95 degrees in summer and 40 below zero in winter. As a solution, the designers came up with a unique oversize heating and ventilating system with a capacity of 155,000 Btu/hr.

Basic body heat is provided by finned tubing within ductwork running down each side of the bus at floor level. Recirculated air is forced over the fins by thermostat-controlled 250 cfm blowers mounted on each front wheel housing. An adjustable damper allows a controlled amount of fresh air to be admitted through the heater core to the defrosters which, along with a duct to direct air at the driver's feet, are all connected into this basic 95,000 Btu/hr unit.

A secondary heating and defrosting system uses finned tubing which runs along each side just above the window. Water or coolant from the heating circuit below is fed into the upper circuit by an electric pump. Air comes from two grilles in the front overhang and passes through filters and fans down the ducts behind the card racks.

In passing vertically over the finned tubing, air is discharged down over the windows, giving the passengers additional heat and defrosting the windows. When the outside air is extremely cold, recirculated air is mixed with it. This 60,000 Btu/hr secondary system is shut off in summer and the ductwork acts to bring cooler upper air down on the passengers.

Although the heat provided by the engine is less than the Btu's used if the system were running at capacity, the coolant acts as a reservoir to provide the capacity over a limited period. The over-all capacity of the engine is more than enough for steady running and the coolant reservoir provides the reserve necessary for a fast recovery of interior temperatures following stops.

#### Unique air suspension

The air suspension system is a unique Can-Car design that has been in use for two years. The coach is supported by eight rubber bellows, four per axle, which are bolted to the underframe crossmembers and to the ends of longitudinal tubular perches. These perches are attached to the axles and act as reservoirs for the bellows.

Because of the wide spacing of the bellows and the fact that the reservoirs are divided into two compartments, one for each bellows, only a single pair of radius rods and one transverse Panhard rod are required. Torque, due to acceleration or braking, is absorbed by the bellows.

Three leveling valves, mounted on the frame and coupled to the axle, control the amount of compressed air to the bellows and assures a constant floor height regardless of the number of passengers. An automatic cut-out switch is provided at the accelerator pedal to lock the air in the system when the coach is in motion and so prevent excessive air consumption.

Because of bumper pads within the bellows to take the shock of bottoming directly on the frame, the designers were able to use a lighter and non-structural fibreglass wheel housing. In the past these wheel housings took much of the bottoming shock and had to be heavily constructed to withstand the full shock loads imposed on them.

#### Economy in design

Many of the designers' hours were spent in providing a combination of factors they hope will add up to a maximum in fuel and operation economy. By transferring the engine to the rear, for instance, the weight distribution was transferred from 40% front and 60% rear to 37% front and 63% rear. This results in the use of smaller size tires and an anticipated increased tire life.

V-belt drives for engine accessories were replaced in all but one case by gears driven from the crankshaft. In this one case a slotted timing belt was chosen to drive the alternator. By using the new CAV 'DPA' fuel pump Can-Car made a saving in weight and a number of moving parts. A finer and lower idling adjustment is also possible.

To provide cleaner fuel (No. 2 diesel is recommended) low pressure twin parallel filters were used. Although lift pump suction pressures are reduced, the system provides cleaner fuel and ensures longer pump and injector life. A large capacity oil bath air cleaner designed to fit a streamlined intake manifold, large intake valves and a close-coupled exhaust system enable the engine to be charged with a maximum amount of air.

The designers chose the A.E.C. A-690 diesel engine to power the new bus, an engine very similar to the 11.3 litre engine used by Can-Car since 1952, but with stronger components. Because the space was small, A.E.C. engineers co-operated in adapting the engine so that it could be mounted transversely at the rear and at an angle of 45 degrees. The move meant a new oil pan design but resulted in greatly improved access to engine components — and a 150 lb saving in weight over the horizontal engine.

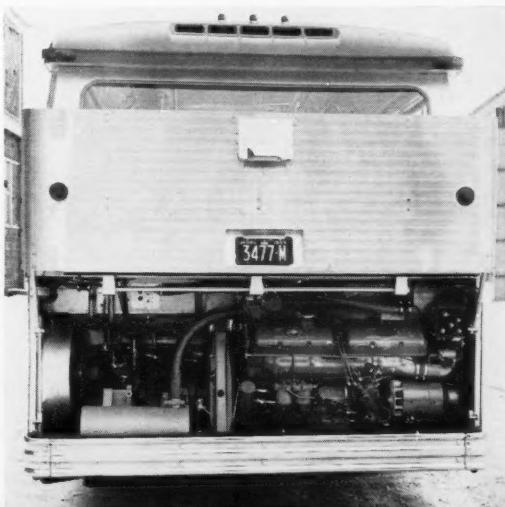
Two versions of this engine are being used. The normally aspirated engine is rated, gross, at 175 bhp at 2,000 rpm and 505 lb ft at 1,100 rpm. The turbo charged engine uses a Schwitzer blower unit and is rated, gross, at 218 bhp at 2,000 rpm and 687 lb ft at 1,200 rpm. The transmission is Spicer's Model 183 three stage torque converter.

Designers had a toughie to solve in connection with the radiators. Because of the combined length of engine and transmission, the normal spot at the end of the engine would make the compartment too crowded. This spot, together with another normal spot at the rear corner of the bus, was also quite vulnerable to collision damage.

Solution was reached by placing the two interchangeable radiators in a relatively collision-free area at the rear of the coach and horizontally above the engine, a solution which also provides close coupling with the power plant. The fan draws air through thermostatically controlled shutters on the left rear side of the coach, and, in effect, pressurizes the engine compartment.

The air is forced over the engine and transmission and is exhausted through the radiators and a grill extending under the rear window. A surge tank equipped with vacuum and pressure relief is located near the radiators.

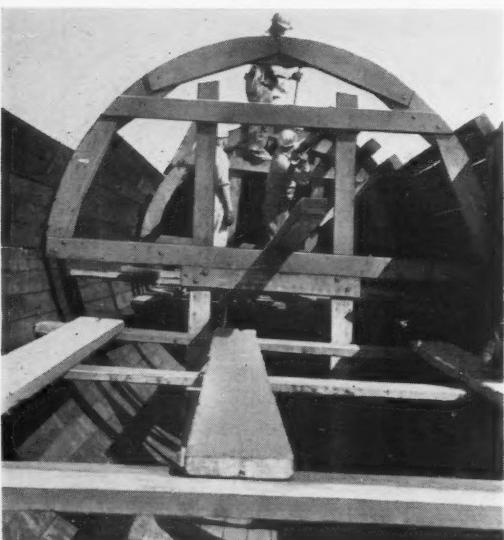
Can-Car took advantage of the downtime necessary for the model changeover to move their design and production facilities from Fort William, Ont., to a new \$17,000,000 plant in Lachine, near Montreal. Two pilot models have been made and it is expected the bus will be in full production within a few weeks. Orders for 46 of the buses have been received to date. ★



4. The two interchangeable radiators are in the rear of the bus with the engine — a unique arrangement.



1. Segment of pipeline shows how wood-stave design easily adapted itself to rugged, undulating terrain.



2. Construction view of 10 ft. 2 in. ID pipeline.



3. Note the planking details of 6,050-ft.-long pipeline.

## Wood pipeline design still popular with some engineers

**Wood can still be put to good use with sound engineering design and expert field supervision**

Wood — that old fashioned material which is slowly losing out to plastics for many of its former applications — can still be put to good use, with sound engineering justification.

Many design engineers tend to scorn wood as belonging to the past. It lacks glamour, they feel. It is uneconomic, others claim. But this is just not true in all cases.

Take for instance, the problem of large size pipe lines. Wood-stave pipe recently was selected as the ideal solution to a major construction problem for a hydro-electric generating station.

Kiln-dried, pressure-creosoted Douglas fir was chosen for the construction of a 10 ft 2 in. inside diameter pipe, 6,050 feet long, to deliver water from the dam to the generator station for power development.

Service was prime factor in the power company's selection of wood pipe. The excellence of this service was demonstrated when 336 feet of the original untreated wood pipeline needed replacement in June, 1958, after nearly 30 years of trouble-free operation, and this break was repaired within 23 days.

The power company decided to completely reconstruct the pipeline of wood, this time using the Douglas fir to provide an installation with a life expectancy of 50 years or longer. The staves were finished 3½ inches thick and 5½ inches wide with 72 to the circle. They were fabricated with a specially designed malleable iron casting between stave ends to ensure watertight joints. The continuous stave pipe is banded with round steel bands connected with malleable iron shoes.

The original bands and many concrete cradles and sill foundations were salvaged and reused in the new pipeline, saving many thousands of dollars.

This heavy duty pipe was designed and engineered by Simpson Engineered Wood Products Company of Portland, Oregon. ★

We'll see you at the 1960

## Design Engineering Show



*Part of the crowd at last year's show.*

### Note these facts . . .

#### The Show

- Place: New York Coliseum  
Dates: May 23-26, 1960  
Hours: 12 noon to 5.30 p.m. daily Monday through Thursday  
Registration: \$2 payable at the registration desk. Use the rapid registration form provided in this issue

#### The Conference

Sponsored by the Machine Design Division, American Society of Mechanical Engineers

- Place: New York Coliseum  
Dates: May 23-26, 1960  
Registration: \$5 for ASME members  
\$10 for nonmembers  
Includes copy of Conference Proceedings

#### . . . and then read these

|   |    |
|---|----|
| Selling to U. S. industry .....         | 50 |
| ASME Conference program .....           | 54 |
| Canadian products to be displayed ..... | 56 |

Engineers and manufacturers will get a glimpse of the products of the future and the components and materials that go into them, when the Design Engineering Show is unveiled on May 23. The show will run for four days at the Coliseum in New York.

Everything that goes into the ultimate products used in the home or factory will be on display. Mechanical components will be shown by 105 companies, electrical and electronic components by 94, power transmission equipment by 65, metallic materials by 61, non-metallic materials by 55, shapes and forms by 53, fasteners and adhesives by 49, finishes and coatings by 23, and 62 companies will have exhibits to show engineering equipment and services.

Twenty thousand engineers and company executives, whose responsibility it is to design the products of tomorrow, are expected to attend. Virtually every major manufacturing company in the U. S. and Canada will be represented among the visitors. Some companies send teams of as many as twenty to inspect the various products displayed. About 15,000 products, which go into the making of end products, will be shown.

Concurrently with the show, and also at the Coliseum, the machine design division of the ASME will hold a four day conference. This year's papers will apply to the application of space-age design theory and techniques to new consumer products. Advances made in power, control, materials, computers, components and mechanics will be considered.

Design Engineering will be there as part of the Canadian section—what say you meet us at our booth? An advance rapid registration card is included in this issue for your convenience.

# Selling Canadian goods to US industry

## Canadian manufactured parts and components meet ready response

*Many of the automobiles coming off the production lines in the United States every day are equipped with component parts made from Canadian-built molds and dies. A Windsor, Ontario firm exported over two million dollars worth of plastic molds to the United States in 1959 on the strength of quality and workmanship alone. This business has developed over the last four years.*

*Several years ago a Canadian company designed and patented a small tire-vulcanizing machine. The firm decided to explore sales possibilities in the United States, found the response good, and today sells about 65 percent of its production to U. S. customers.*

*When copies of the "New York Times" come off the presses each evening, they are expertly bundled up by a Canadian-made machine. Developed by the "Toronto Star" about 24 months ago, it is used by other big newspapers across the border, including the "Chicago Daily Tribune" and the "Dallas Star."*

These examples point up the fact that the United States, a highly industrialized country, skilled in engineering techniques, has become a good market for engineering equipment and industrial machinery from neighboring Canada. Recent months have brought orders for a gas-separation plant for California, for mine hoists, for a machine that extracts hydrogen and oxygen from water electrolytically, for oil-refinery equipment, and for many other types of Canadian products.

Figures tell the same encouraging story. For instance, in the first three quarters of 1958, sales of metalworking machinery, n.o.p., to the United States totalled \$684,000; in the first nine months of 1959, \$1.3 million. The record is even better in machinery and parts n.o.p.—\$4.7 million for 1959 compared with \$3.5 million last year. Comparable figures for metalworking drilling and boring machines are \$252,000 as against only \$89,000 in the 1958 period and for ball and roller bearings and parts, \$644,000 compared with only \$220,000.

### Canadian assets

The United States has in fact become our main export market for machinery and machinery products, but this doesn't mean that anything in this line will sell there. Nor is the selling easy. Canadians have succeeded best in marketing light industrial machinery designed to undertake special jobs—the newspaper bundling machine is a good example. Our machinery exports included other types but the specially designed machine with unique features, often custom-tailored to do a specific job, has the edge.

Canadian industry sometimes under-estimates its capacity and knowhow compared with that of its industrially powerful neighbor. This psychological hurdle has to be overcome before a company can market its product aggressively across the border. Yet Canada,

possesses certain initial advantages in the competition for markets. Our labor dollar buys more than it does in the United States; our raw material costs compare favorably. We have first class technical brains at work. The United States recognizes these facts; one proof is the business placed here by US prime contractors engaged on overseas projects. Recently a Canadian company supplied to a US contractor oil-refinery equipment for use in Mexico and in Australia. A US firm setting up a hot and cold strip rolling mill in Japan bought some of the equipment here.

Surprisingly, one Canadian firm has found it easier to get US than Canadian customers. This firm developed a tracing attachment for metalworking machines. Cold-shouldered here, it turned its attention to the US market and made sales. The device was displayed at the 1959 Design Engineering Show in Philadelphia. This in turn enhanced its prestige and boosted its sales at home. Another company which worked out a method of precision assembly by die casting that eliminates distortion has also sold to the US. Lately it received a serious US inquiry for enough of its machines to turn out one million parts a day.

### Salesmanship needed

Given the advantages just outlined, Canadian machinery still doesn't sell itself. Canadian firms in search of US customers must realize that machinery, like breakfast food, has to be merchandised. And one can't give prospects a sample, or merely show them a picture in a catalogue. The man has to see with his own eyes what the machine will do. Take the method of assembly by die casting mentioned above. Preliminary market research turned up the names of certain US prospects. They were invited to pay a visit to the Canadian plant and observe this assembly system in operation. Once interest was aroused, the Canadian firm sent its engineers into the prospect's plant to study his production, bring the problem back, and work out an adaptation of the machine. (Naturally, machinery

---

*Mr. Johnson is commodity officer, Engineering & Equipment Division, Department of Trade and Commerce.*

## **DESIGN ENGINEERING**

welcomes you to the

# **1960 DESIGN ENGINEERING SHOW NEW YORK COLISEUM MAY 23 TO 26**

REGISTRATION FEE \$2.00 Payable on arrival at show.

- Ideas to help you spark new dreams • Applications to help you create superior products • This is the one place where more than 400 of the nation's most imaginative materials and components manufacturers gather under one roof to give a plus to your thinking—to help you solve your design and development problems • Exhibits are staffed with engineers! Compare-first-hand • Test • Come away with hundreds of new ideas that can influence your work for the whole year ahead • It's part of your job to attend •

### **RAPID REGISTRATION**

No standing in line  
if you use this rapid  
registration card correctly!  
See instructions reverse side.

### **SHOW HOURS**

Monday Noon to 5:30 pm  
Tuesday Noon to 5:30 pm  
Wednesday Noon to 5:30 pm  
Thursday Noon to 5:30 pm

CHILDREN NOT ADMITTED

**DESIGN ENGINEERING SHOW**

|               |                          |
|---------------|--------------------------|
| NAME _____    | TITLE _____              |
| COMPANY _____ | CO. STREET ADDRESS _____ |
| CITY _____    | STATE _____              |

► DO NOT DETACH ◄

**RAPID REGISTRATION**

Fill in card and stub COMPLETELY. Use TYPEWRITER only. Handwritten or incomplete cards subject to delay. DO NOT MAIL CARD. Bring it to Registration Desk at the Show.

YOUR NAME \_\_\_\_\_

TITLE \_\_\_\_\_

COMPANY NAME \_\_\_\_\_

CO. ADDRESS (STREET) \_\_\_\_\_

CITY \_\_\_\_\_ ZONE \_\_\_\_\_ STATE \_\_\_\_\_

COMPANY'S BUSINESS OR PRODUCT \_\_\_\_\_

YOUR HOTEL \_\_\_\_\_

For additional show tickets, and conference information write to:  
Clapp & Poliak, Inc., 341 Madison Ave., N. Y. 17, N. Y.

LITHO IN U.S.A.

of this type should be protected by world-wide patents before any attempt is made to enter foreign markets.)

#### Go to the fair

It's not always easy to persuade an American company to dispatch men to Canada to look over a new piece of equipment. The alternative is to take the machine to them. Impractical? Not if the Canadian manufacturer displays it at one of the specialized trade fairs in the United States. There he can set up his machine and demonstrate it to technical men who attend these fairs to become familiar with new equipment and new production methods.

The Department of Trade and Commerce has taken the lead in organizing Canadian participation in these fairs. In October 1958, 11 Canadian firms displayed machines at the Western Tool Show in Los Angeles. The results were heartening. One company alone expects ultimately to do \$700,000 worth of business as a result; it has already written \$100,000 worth. Many of the machines were sold right off the floor. In April 1959, 26 Canadian firms exhibited products and services in the field of nuclear energy at the Atom Fair in Cleveland, Ohio. In May, 26 Canadian companies sent exhibits to the Design Engineering Show in Philadelphia and in November, 14 had products at the 41st National Metal Exposition in Chicago. Eight Canadian-made machines were in operation at this fair.

Even at fairs, machines have to be marketed. Each company must supply two operators for each machine—men who are also well versed in the sales approach. Many send in addition some of their senior executives; at Los Angeles the president and secretary-treasurer of one company were on hand throughout the show and returned home convinced that it was time well spent.

#### Benefits widespread

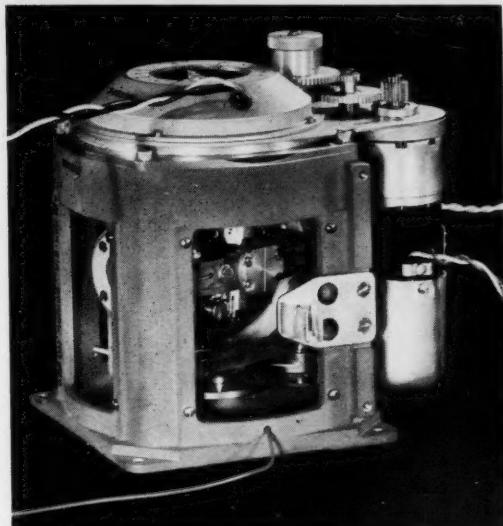
Participation in trade fairs in the United States appears to benefit Canadian industry in general as well as individual exhibitors. Some US industrialists still regard Canada primarily as a good place to hunt and fish; our progress towards industrial maturity has escaped their notice. Collective displays at trade fairs help to correct this impression and have even led certain US companies to consider manufacturing some of their products here, either through licensing or by setting up subsidiary companies.

#### Surveying the market

If the US market has possibilities, it also presents the exporter with certain problems. The initial one is where and how to start looking for American clients. The manufacturer often finds this simpler than the maker of consumer goods. His best markets will lie in the areas where industries that can use his products are concentrated. The man who makes molds useful in the motor-car industry will turn to Detroit; the company with a product of value to the aviation industry will investigate Los Angeles. Two or three areas are usually enough to experiment with and the Department of Trade and Commerce stands ready to help the exporter with suggestions and advice.

#### Service problem

Once a sale has been made, the question of service and of speedy replacement of parts when necessary assumes importance. The prospective US buyer wants reassurance on these points. Many Canadian companies when they have a fair volume of US business, find



Typical of the equipment that is being marketed in the U. S. is this anti-G valve.

it practical to set up sales and service depots at various places. Some even establish a subsidiary company in the US. As one old hand puts it, once your products have cleared the border and the duty has been paid, you are "home free." Parts can then be stockpiled and distributed quickly when the need arises. The Canadian firm that developed the process for extracting hydrogen and oxygen from water now has a subsidiary company in Buffalo; the makers of the tracing attachment have service depots in Chicago, Los Angeles, and other industrial centres.

Important too, is the securing of good agents who will look after the exporter's interests and push his products. The US offices of the Canadian Trade Commissioner Service can supply the names of reliable agents and the manufacturer can then negotiate with them directly. One excellent way to make contact with agents is at the specialized trade fairs; agents attend them to discover new lines to handle and to look over the equipment exhibited.

One factor in success across the border is close adherence to delivery schedules; the man with an eye to business lives up to his delivery promises. Canadians commonly have a better record on this score than their competitors from other countries. This can be a useful argument in obtaining business.

The process of selling the type of product that Canadians are now shipping to the United States has three phases—the designing to meet the client's needs, the working out and quoting of a delivered price, and the building when the order is secured. Two years may elapse between the time the manufacturer holds his first discussions with the customer until the finished product is delivered. The search for orders thus must be started early and continued over a long period.

The United States is not necessarily the only market for Canadian products, but it is nearby and it is the only one that has been seriously cultivated. The experience of their colleagues should tempt more Canadian companies to try their fortunes there. \*

# 1960 ASME Design Conference . . .

Monday, May 23

## 9.45 A.M. NEW HORIZONS IN ENGINEERING DESIGN

A panel of design authorities will, by brief talks and answers to questions, show how new design principles, relationships, and formulas developed specifically for their fields of nuclear and space technology can be applied to develop better designs of commercial products. Included will be applications of materials and components to meet extremes of environmental conditions and to achieve the ultimate in performance. High and low temperatures, erosion, corrosion, impact, vibration, miniaturization, reliability, and limited life will be among the items discussed.

*Co-chairmen:*

DR. HUGH L. DRYDEN, Deputy Administrator, National Aeronautics and Space Administration, Washington, D.C.; DR. ARTHUR R. KANTROWITZ, Director, Avco-Everett Research Laboratory, Everett, Mass.

*Panel:*

W. R. GALL, Chief of Design Section, Reactor Experimental Engineering Division, Oak Ridge National Laboratory, Oak Ridge, Tenn.; V. D. SCHWARTZ, Assistant Project Manager, Army Boiling Reactor Project, Combustion Engineering Inc., Windsor, Conn.; G. P. SUTTON, Advanced Research Projects Agency, Department of Defense, Washington, D.C.; E. P. WHEATON, Vice-President Engineering, Missiles and Space Systems, Douglas Aircraft Inc., Santa Monica, Calif.

Tuesday, May 24

## 9.30 A.M. RELIABILITY

Reliability is now recognized as being a physical phenomenon which is basically a design problem. Methods and interpretation of answers to reliability predictions will be discussed, as well as the meaning of reliability requirements in equipment specifications, and the types of special design techniques which can be used to meet these requirements.

*Co-chairmen:*

FRANK McGINNIS, Director of Reliability, Sperry Gyroscope Company, Great Neck, N. Y.; NICHOLAS OSIFCHIN, Military Development Engineer, Bell Telephone Laboratories, Inc., Whippany, N.J.

**60-MD-1 :**

### Reliability Prediction — its Validity and Application as a Design Tool

THOMAS C. REEVES, Director of Product Assurance, RCA Defense Electronic Products Division, New York, N.Y.

**60-MD-2 :**

### Impact of Reliability Design

HARRY R. POWELL, Member of Senior Staff, Space Technology Laboratories, Los Angeles, Calif.

## 9.30 A.M. FABRICATION

In the joining and forming of metal parts many new processes have been developed in the past few years. Papers will cover areas where the newer methods overlap or replace the older processes and indicate the areas where newer methods have distinct advantages. Tolerances, quality and solutions to problems will be stressed.

*Co-chairmen:*

HEMENWAY R. BULLOCK, Senior Engineer, Metallurgical Laboratory, Government Equipment Division, Raytheon Company, Maynard, Mass.; JOHN ALICO, Manager, New York Office, Day and Zimmerman, New York, N.Y.

**60-MD-3 :**

### New Welding Processes

JOHN C. CHYLE, Director of Welding Research, A. O. Smith Corporation, Milwaukee, Wis.

**60-MD-4 :**

### Metal Fabrication by Explosives

VASIL PHILIPCHUK, Manager, Special Projects Department, National Northern Division, American Potash & Chemical Corporation, West Hanover, Mass.

## 9.30 A.M. HYDRAULICS

Emphasis will be on the "extreme service frontier" for components, fluids and seals used in ground equipment, aircraft, space vehicles and nuclear power units. Extreme pressure, temperature, reliability, capacity/weight ratio and other salient points will be covered, and trends and improvements possible.

*Co-chairmen:*

EDWARD M. GREER, Chairman, Greer Hydraulics, New York International Airport, Jamaica, N.Y.; JOHN A. FARRIS, Manager, Engineering Liaison, Aircraft Porous Media, Inc., Pall Corporation, Glen Cove, N.Y.

**60-MD-5 :**

### Current Status of Hydraulic Pumps and Some Trends

EDWARD BROWN, Director of Engineering, Machinery Hydraulic Division, Vickers Inc., Detroit, Mich.

**60-MD-6 :**

### Hydraulic Fluids — Today and Tomorrow

RICHARD L. LESLIE, Supervisor, Fluids and Chemistry Group, Research and Development Department, Vickers Inc., Detroit, Mich.

# ... May 23 to 26 New York Coliseum

Wednesday, May 25

## 9.30 A.M. CONTROL SYSTEMS

Computers have a two-fold use in the control field: one, to design the control system based on the known variables as indicated by an analog unit; and two, as part of the control system to maintain process or control function. Papers will cover the main engineering problems associated with these computer uses.

*Co-chairmen:* DR. E. L. HARDER, Director, Analytical Department, Westinghouse Electric Corporation, East Pittsburgh, Pa.; JOHN T. LYNCH, Manager, Electronic Department, Burroughs Corporation, Paoli, Pa.

### 60-MD-7 : Analysis of Control Systems by Analog Computers

WILLIAM E. SOLLECTIO, Systems Analysis Engineer, General Engineering Laboratory, General Electric Company, Schenectady, N.Y.

### 60-MD-8 : Computers in Control Systems

DR. ARTHUR S. ROBINSON, Assistant Chief Engineer, Advanced Research and Development, Eclipse-Pioneer Division, Bendix Aviation Corporation, Teterboro, N.J.

## 9.30 A.M. MATERIALS

High strength steels and composite materials are being used in more applications than ever before, but they present problems in processing and selection. Papers present properties, available forms, and illustrate applications, as well as giving an approach to obtaining optimum characteristics.

*Co-chairmen:* ALBERT R. MEAD, Staff Engineer, Manufacturing Engineering Department, Gruman Aircraft Engineering Corporation, Bethpage, N.Y.; EDWARD N. HEGGE, Deputy Director, Watertown Arsenal Laboratories, U. S. Army Ordnance Arsenal, Watertown, N.Y.

### 60-MD-9 : Some Considerations in the Use of High Strength Steels

A. M. HALL, Division Chief, Batelle Memorial Institute, Columbus, Ohio.

### 60-MD-10 : Increasing the Performance of Nonmetallic Structural Materials

W. E. DIRKES, Chief, Plastics Branch, Materials Laboratory, Wright Air Development Center, Wright-Patterson Field, Ohio.

## 9.30 A.M. AUTOMATION

More errors are made in designing for automatic assembly because parts are not designed with the method in mind. Papers will cover the design recommendations for miniature and subminiature components to give ease of assembly, and product do's and don'ts to facilitate economic and practical assembly.

*Co-chairmen:* GEORGE F. HAWLEY, Director of Development and Engineering, Automation Engineering Laboratory, Inc., Stamford and Greenwich, Conn.; ALLAN HARVEY, President, Dasol Corporation, New York, N.Y.

### 60-MD-11 : Concept of Modular Design for Mechanized Assembly

A. A. LAWSON, Consulting Project Engineer, Melpar Inc., Falls Church, Va.

### 60-MD-12 : Basic Design Parameters for Automatic Assembly

ROBERT ESKEN, Supervisor, Engineering & Sales Application, Autometrology Section, Sheffield Corporation, Bendix Aviation Corporation, Dayton, Ohio.

Thursday, May 26

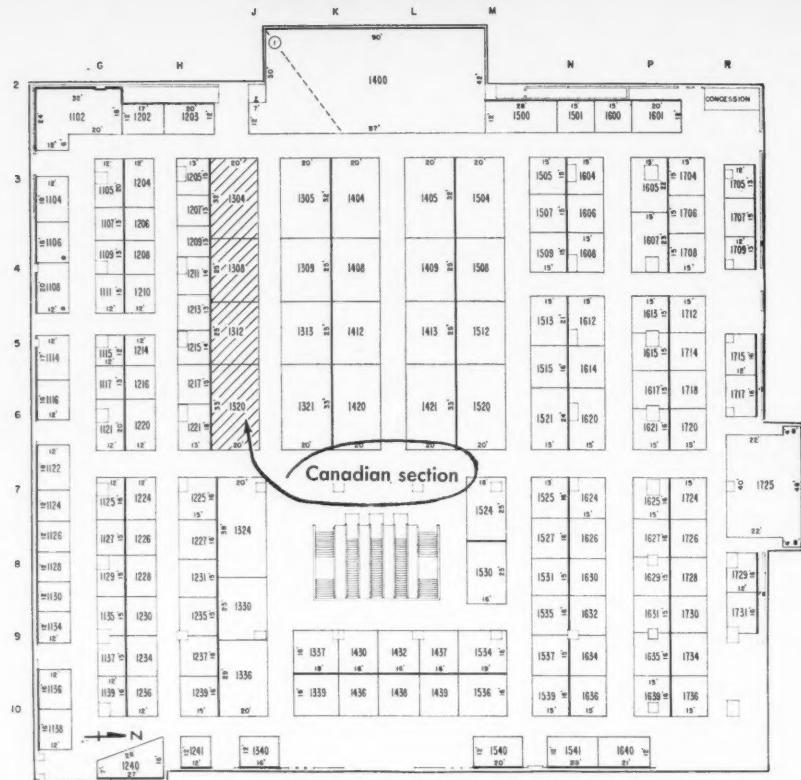
## 9.30 A.M. USE OF COMPUTERS IN DESIGN

Panel of computer users who have had the problems of scheduling and integrating their computer sections into the over-all engineering setup. They will discuss and answer questions on: types of design problems that can be computer solved; types of computers to use; training of personnel; costs of installation and operations.

*Co-chairmen:* DR. JULIUS S. ARONOFSKY, Manager, Electronic Computer Center, Socony-Mobil Oil Company, Inc., New York, N.Y.; RAYMOND PAYNE, Supervisor, Engineering Computer Section, Worthington Corporation, Harrison, N.J.

*Panel:* E. F. MAGNUSSON, Mathematician, Control Programming, General Electric Company, Schenectady, N.Y.; GEORGE RYCKMAN, Supervisor, Machine Operations, General Motors Research Laboratories, Detroit, Mich.; DR. AARON FINERMAN, Digital Computing and Data Processing Division, Republic Aviation Corporation, Farmingdale, N.Y.

## **SECOND FLOOR**



**1960 Design Engineering Show**

## **Here's how Canadians will participate**

## **Seventeen companies feature patent promotion to automatic machinery**

Canadians this year will be taking a greater part than ever before in the Design Engineering Show. To centralize the Canadian representation, as in years past, the Department of Trade and Commerce has booked 2300 square feet of floor space on the second floor of the Coliseum. Here some 17 Canadian companies will be displaying the best of this year's engineering developments.

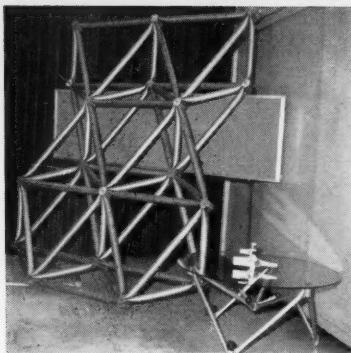
One requirement for show participation is that the product being displayed must be at least 50% of Canadian manufacture.

A similar effort was made last year in Philadelphia (with but half the space) and the Canadian firms represented on that occasion received more than 400 trade enquiries. These emanated from nearly every state in the US and a number came from Canada. The representative of one Canadian firm at the show told DE that he expected to keep his whole company busy processing the enquiries received, without any further

Canadian exports of engineering products and machinery to the US increased by 50% in 1959 over 1958 — and the end is not yet in sight. It is considered that participation in this type of show provides an inexpensive means of testing the large US market. If the potential is there, the interest and inquiries will be evident at the show.

Last year the Canadian section created quite a stir. When the Philadelphia TV station gave coverage to the show, pictures of only the Canadian section were shown — to the chagrin of many US firms. One observer was heard to say "I thought all they made in Canada were Eskimo carvings".

Some of the items which the Canadians will be featuring are described in the next two pages. The list is by no means complete, but it is all that we have been able to obtain from the companies involved.



### Joints and connectors

The unique 9-slot triodetic hub or connector will headline the booth of Fentiman & Sons of Ottawa. Illustrating applications of this connector will be a space frame and circular coffee table.

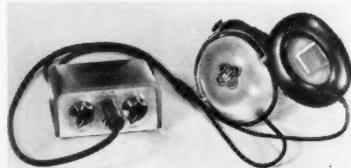
These connectors have a wide range of applications, from small household items to giant radar installations. The manufacturer claims they are stronger than riveted or bolted construction, not subject to thermal stresses due to welding and easily assembled with only unskilled or semi-skilled labor. The design is patented in Canada, U.S., and foreign countries.

*Circle 300 on Reader Service Card*

### Research services

A model railway, hooked up with various instruments to show measurement of dynamic stress due to rolling load on a bridge, impact induced stresses (on mailbag pick-up arm), noise level variation in a tunnel and vibrations on the rail-track, will be displayed by the Ontario Research Foundation to illustrate the role of research and prototype testing in modern engineering design. In addition, photographs and sketches will indicate the various operations of the Foundation and the services offered.

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### For good listening

An earphone with a flat frequency response and a 40 dB ambient noise attenuation will be offered by Sharpe Instruments of Canada, Willowdale, Ont. These phones are somewhat unique in design, as you will note from the illustration. They were developed in collaboration with the National Research Council of Canada and the Sharpe company engineers.

Applications for these units include such varied areas as education, music, schools for the deaf, and industries with a high noise level.

Two tape recorders will be used to demonstrate both the speech and music listening qualities.

Also on display will be a new type headset which was developed for use in speech therapy for the hard of hearing and impaired speech due to disease. Chief characteristic of this headset are its built-in amplifiers, speakers and microphones.

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### Measurement devices

Industrial automation has brought with it the need for automatic control and measurement equipment never even dreamed of previously. Six such instruments will be promoted at the show by Measurement Engineering Limited of Arnprior, Ontario. These will be:

- Brightness meter—used by pulp and paper firms for determining the brightness of paper.
- Flow turbitol—measures turbidity of liquids in process.
- Dew point detector—used in corrosion studies.
- Leg belt monitor—used in grain handling to reduce potential fire hazards.
- "Hycon" test set—foundry instrument for hydrogen content.
- Dynamic ground detector—used in hospitals to reduce danger of anaesthetic explosions.

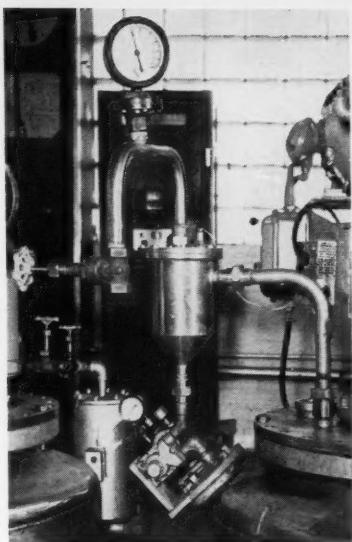
All these instruments have been Canadian designed and manufactured. They are only six of the many available from the Arnprior company.

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### Canadian patents

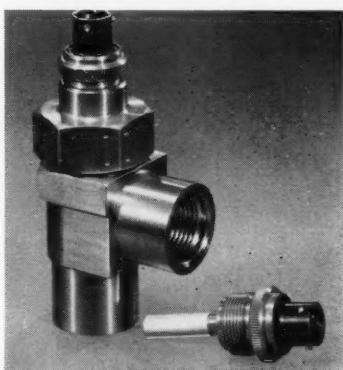
One of the problems in the design field is that Canada's approach to the use of government-owned patents is very different from that of the U.S.—a fact that is not too widely known. Patent Handbooks will be distributed to potential licensees by Canadian Patents and Developments Limited of Ottawa.

Their display will be highlighted by an exhibit of nickel-plated and electro-formed items produced by a novel Canadian process which enables the plating of nickel onto aluminum, iron, steel, zinc, copper, brass and other metals.



Working models will include a foam breaker and densimeter. Small non-working models will include a magnetic core memory for digital computers, an aircraft wing structure and a sine/cosine potentiometer.

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### Wide range of products

In accordance with their current intensive diversification program, Aviation Electric of Montreal will present a very diversified display of products. Mechanical, electrical, electronic, pneumatic and hydraulic units designed for military, hospital and industrial uses will be included.

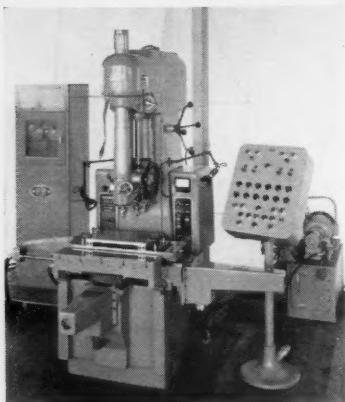
Some of the specific items will be: registering 'G' meter; pyrotechnic valve; cesium unit; ball resolver; gate suspension for gas masks; end preparation machine for metal pipe; pneumatic relief valve; torpedo course control; anti-G valve; disconnect, composite leads; tank navigator.

Each of these items has been designed and developed in Canada.

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continued ▶

# Canada at the Design Engineering Show — *continued*



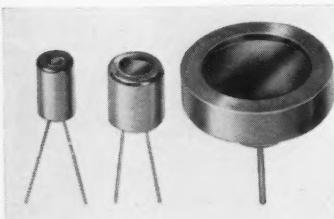
## Machine controls

Point-to-point positioning controls designed specifically for application to machine tools will be featured in a working display by Sperry Gyroscope Company of Canada, Montreal. These controls incorporate design and operational features considered essential by the metal-working industry.

The system, as a whole, represents a unique combination of analogue and digital techniques so applied as to obtain maximum benefit from the two basic design philosophies.

The exclusive Sperry tape reader to be shown obviates the necessity for a shift register or memory store, thus greatly reducing the component bulk of the control and conversely increasing its inherent reliability.

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## Alpha particle detectors

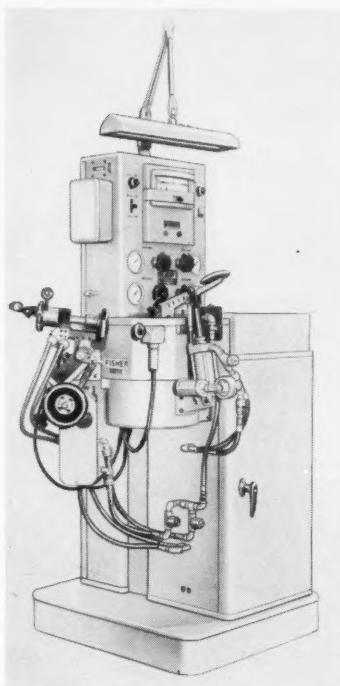
RCA Victor Company Limited of Montreal plans to display a number of alpha particle detectors (three types are shown in the picture) and three portable detection units which employ these detectors. The units will be prototypes and will be shown only to indicate some of the applications of the detectors.

The RCA detector is a small rugged "solid state ionizing chamber" capable of detecting individual alpha particles of energy 0.5 Mev or more. Its development marked a major advance in radiation detection.

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## Precision die casting

Fisher Gauge Works of Peterborough, Ontario, will be featuring their model 24 semi-automatic assembly die casting machine in operation and producing give-away samples. This machine made quite a hit at last year's show.



The search for cost-saving manufacturing methods leads naturally to consideration of automatic machines. Substantial economies are effected, not only by the increased speed of the assembly operation itself, but by design simplification made possible by the die casting operation. This often permits the elimination of component parts, substitution of simplified parts, lighter weight parts.

The give-away sample produced at the show is a toy top. Its manufacture is similar to the assembly of a gear and shaft arrangement as used in a watt-hour meter.

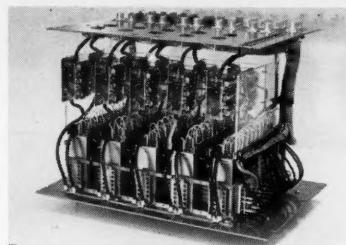
*Circle 308 on Reader Service Card*

## Electronic equipment

A young and growing Canadian organization known as Central Dynamics Ltd. of Montreal, will have a variety of their products on display. These will include:

1. A two-speed servo-amplifier, 60 cycle, completely transistorized. Constructed to operate from -30 to 150°F in a humid environment.

2. A 2 KW battery charger, delivers up to 160 amps. Output current adjust-

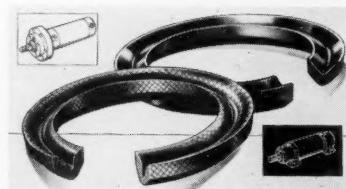


able in 21 steps. Silicon rectifiers are used, protected by a magnetic circuit breaker.

3. Video amplifier, fully transistorized designed to pass video signals. Has excellent over-all operating characteristics.

4. Video-audio switcher, will accept ten separate video signals with associated audio. Each video output line is buffered and each audio output is fed via a bridging transformer.

*Circle 309 on Reader Service Card*

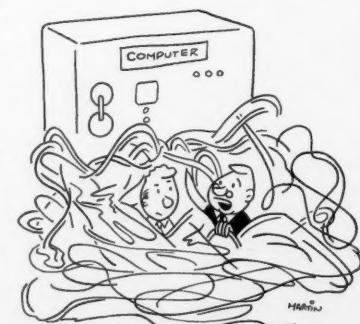


## Hydraulic packings

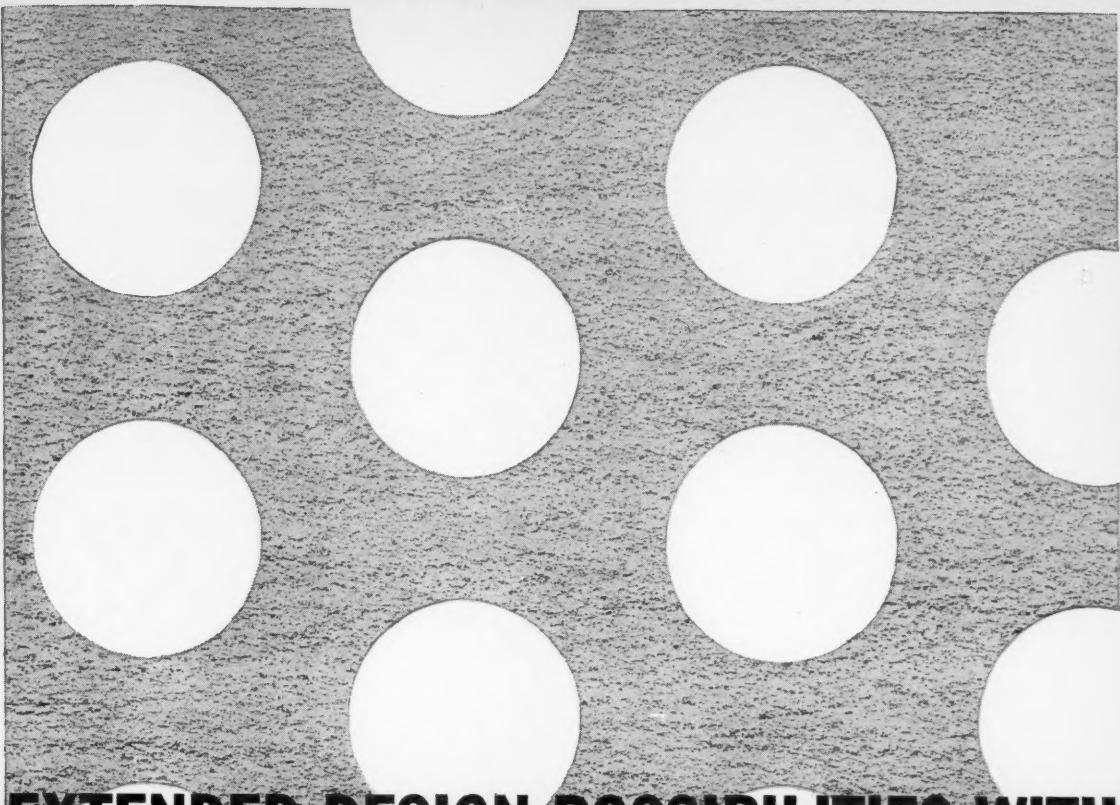
New design improvements in hydraulic packings to meet modern rigid requirements will be displayed by the Crane Packing Company in co-operation with their parent US firm. Booth number will be 512.

Included will be V-rings, U-cups, piston cups and wiper rings. The homogeneous V-rings are designed for application on reciprocating pumps, shock absorbers, cylinders, valves and other hydraulic and pneumatic installations.

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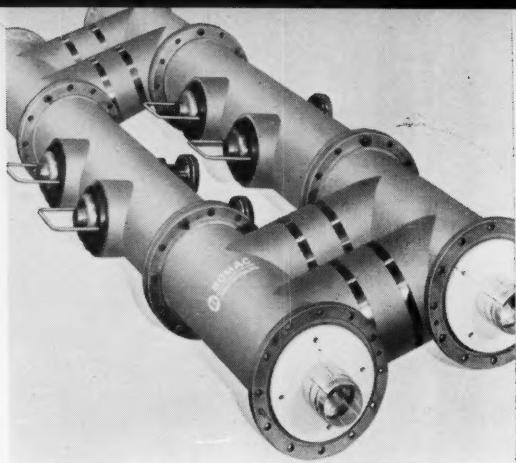


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Field representatives all across Canada.

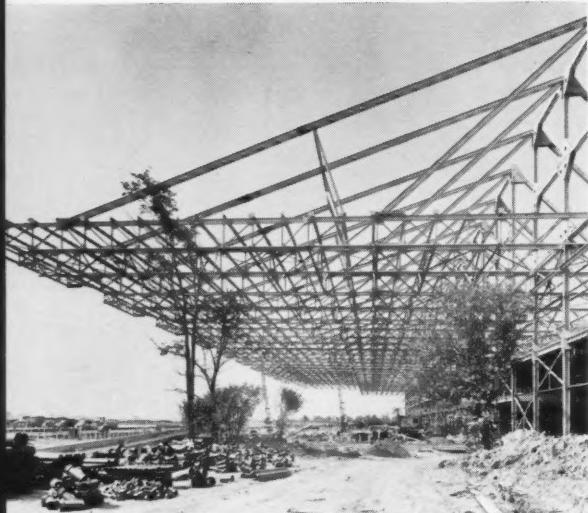
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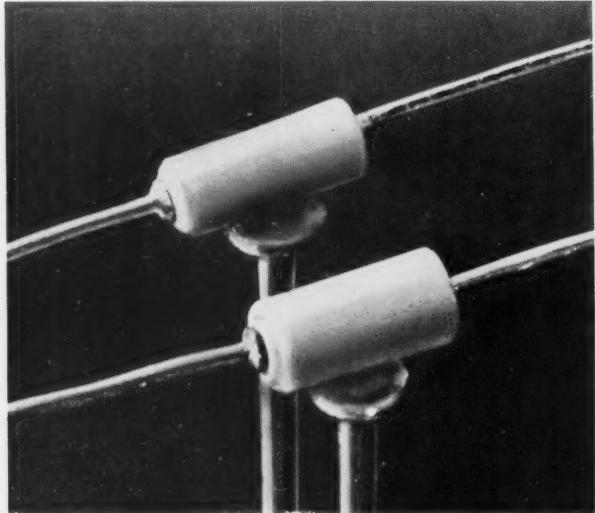
## Designnews in Pictures



Balanced coaxial line duplexer looks more like a massive piping installation.



Believed to be the longest cantilever in North America, this TCA, Montreal, roof is free of supporting columns along its entire length.



Tiny tantalums on pinheads—these units tax the human credulity. Smallest is only .150 in. long by .060 in. diameter.



New beryllium oxide ceramic for vacuum tube gets micrometer check before shipping.



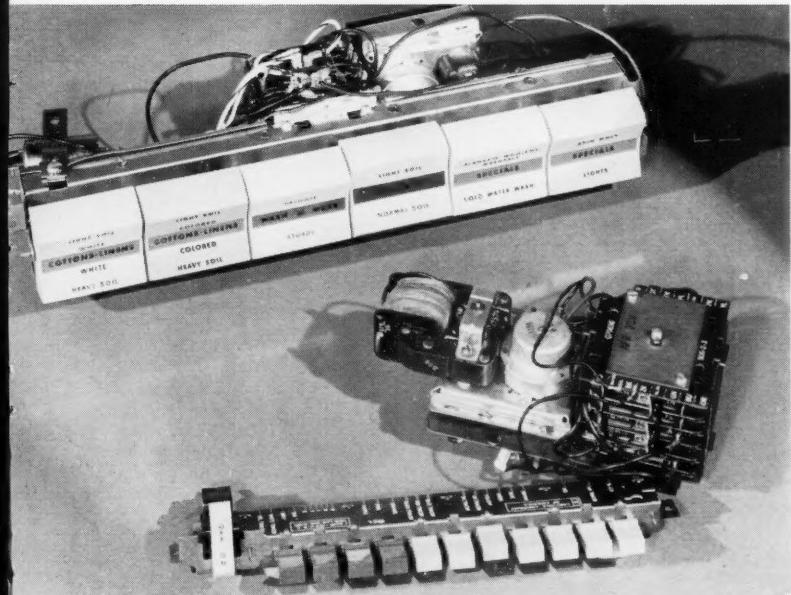
Walk on water with polystyrene shoes. Power is supplied by quick back-and-forth foot motion.



Combined washing machine and dryer from England. Council of Industrial Design award winner.



*Underground tunnels? Well sort of—it's the all aluminum penstock manifold at the Chute-des-Passes project.*



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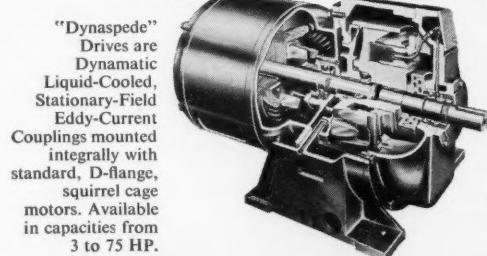
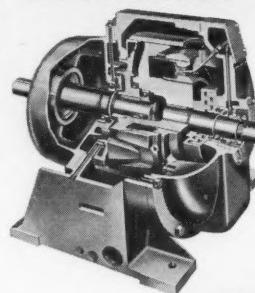
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**2 New Air Regulator with Gauge.** Assures accurately controlled air—prevents erratic operation and damage to equipment. Design permits inlet pressures of 250 PSI—adjustments up to 125 PSI. Excess air pressure "bleeds off" within regulator, instantly.

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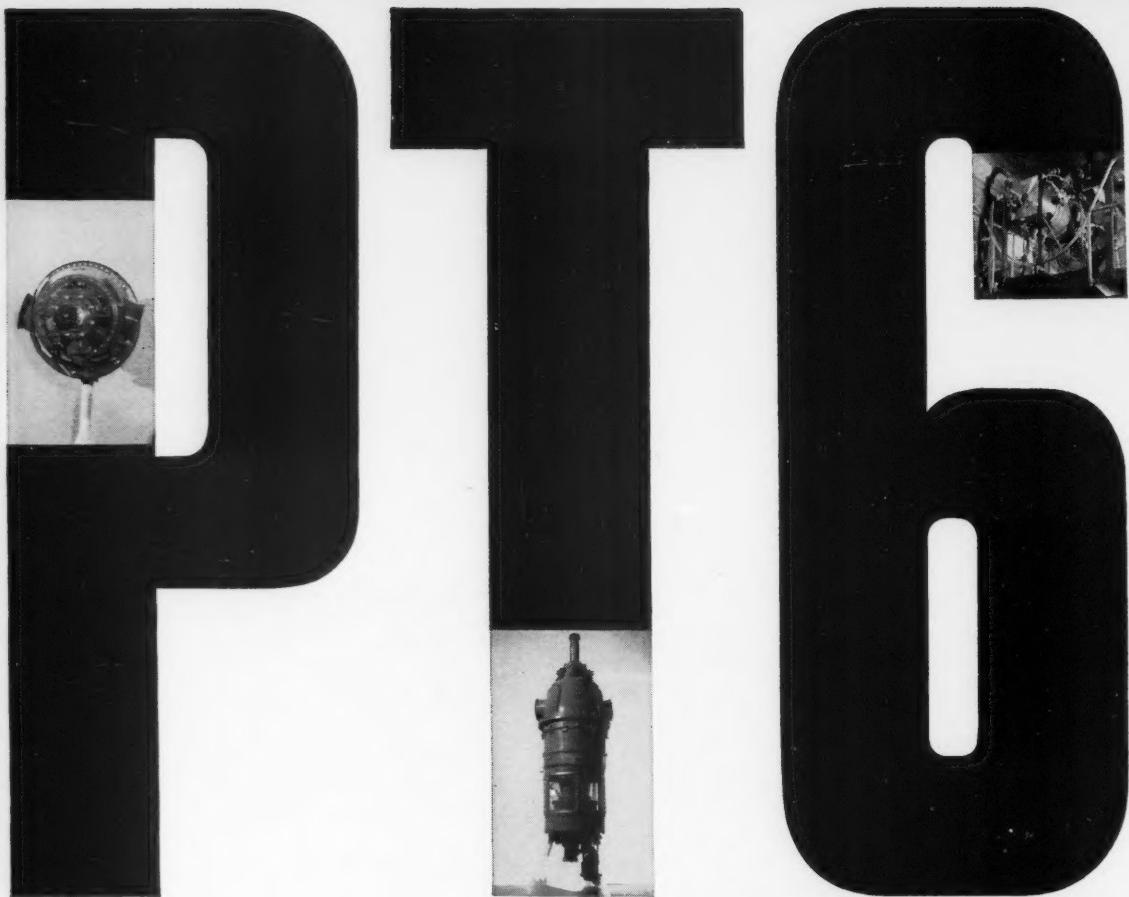


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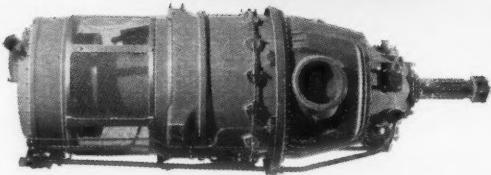
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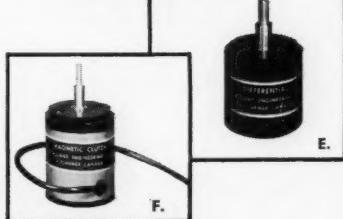
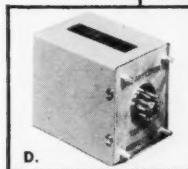
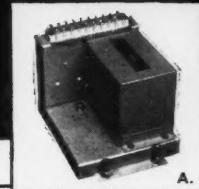
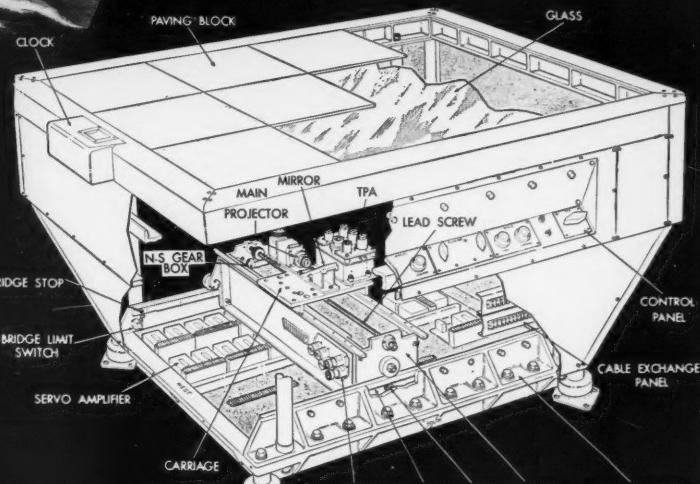
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- C. Transistor Servo Amplifier, Mod. AM-101 (AM-104 + AM-105). *Application:* High gain, 400 c. synchronous amplifier for highest accuracy velocity integrating servo-loop, using up to size 18 Bu. Ord. motor/tachometer generator. *Built-in:* power supplies, null voltage suppressor, tachometer generator phasing network, speed adjustment and quadrature rejection circuit.
- D. Transistor Amplifier, (Pre-Amplifier) Mod. AM-104. *Class A*, all transistor voltage and low power amplifier combined. Voltage gain between rated impedances is adjustable between 50 and 150 V. Built-in power supply, 400 c. (Power Amplifier AM-105 packages in same manner; *Class B*, all transistor synchronous power amplifier-application as positioning and integrating servo amplifier.)
- E. Differential, Model M-134. *Body and Mounting:* Similar to size 18 Bu. Ord. motor. All ball bearings. *Application:* Servo mechanisms and computers. *Speed/Torque:* symmetrical mechanical differential max. speed of any shaft 4000 r.p.m.; max. torque output 10 oz. inch.
- F. Magnetic Clutch, Model M-133. *Body and Mounting:* Similar to size 18 Bu. Ord. motor. All ball bearings. Max. speed 4000 r.p.m. *Application:* Servo mechanisms and computers. Energizing Power: 24 V.D.C., 3 watts. *Min. Torque:* 35 oz. inch.



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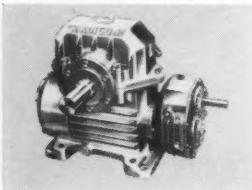
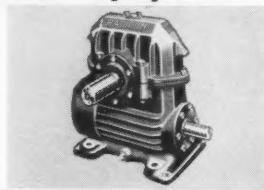
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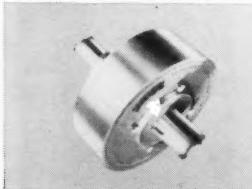
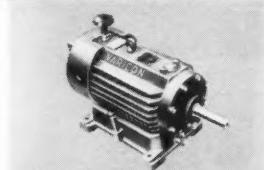
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## Designers' book shelf

**Handbook of Applied Mathematics**, by E. E. Grazda and M. Brenner. Publisher — Van Nostrand, Toronto. 1040 pages. Price \$9.45.

A book that will help you whenever you are called upon to make a math calculation in your office, home or factory. Special sections on maths for mechanics, heating, air conditioning, electricity, electronics, and civil engineering.

*Circle 319 on Reader Service Card*

**Industrial Building Details**, by D. F. Raycroft, registered architect. Publisher — Dodge Corporation, New York. 352 pages. Price \$12.75.

A master reference of industrial architectural details, drawn precisely to scale, and gathered for the first time in book form. Every detail of the contemporary industrial building is shown, including such items as walls, windows, roofs, canopies, parapets, ladders, platforms, storage areas and so on.

This book would make an invaluable reference for those who are called upon occasionally to make architectural designs, as well as the architect and industrial building designers.

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**Electronic Designers' Handbook**, by Landee, Davis and Albrecht. Publisher — McGraw-Hill, Toronto. 1016 pages. Price \$19.00.

A handbook of fundamentals and data that were prepared to help in the design of all types of electronic equipment. The entire electronic field is covered, ranging from vacuum tube and transistor fundamentals, voltage and power amplifiers, to such topics as computer and servomechanism techniques, waveform and network analysis.

The aim throughout the book is to present detailed, practical design data in as simple a form as possible. The discussions are quite complete, and provide an above average reference for the designer engineer.

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**Titanium Welding**, by an AWS committee. Publisher — American Welding Society, New York. 24 pages. Price \$1.50.

*Circle 322 on Reader Service Card*

**Marine Design Manual for Fiberglass Reinforced Plastics**, sponsored by Owens-Corning, 400 pages. Publisher — McGraw-Hill, Toronto. Price \$15.00.

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## Keeping informed

**Standards Association**—Reprint of a paper that explains the organization and relationship between the Standards Association, the Certification Agencies and the approval authorities. Canadian Standards Association.

Circle 324 on Reader Service Card

**Microfilm techniques**—A booklet that describes the most economical and efficient use of microfilm and also covers filing and indexing techniques. Charles Brunning Co., (Canada) Ltd.

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**Retainer bearing**—A four-page engineering data sheet on this company's "W" retainer bearing. The Barden Corp.

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**Voltage digitizers**—Engineering data and performance specifications on eight basic types of digitizers. Adage Inc.

Circle 327 on Reader Service Card

**Pad gauges**—Features and specifications of gauges that can be welded right onto a tank or other vessel. Peacock Bros.

Circle 328 on Reader Service Card

**Aircraft bolts**—Bulletin describes new line of high-strength, light-weight bolts for aircraft. Standard Pressed Steel Co.

Circle 329 on Reader Service Card

**Stainless steel tubing**—A 34-page booklet that gives details on the various sizes, grades, design data, corrosion resistance and other information on stainless steel tubing. Allegheny Ludlum Steel Corp.

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**Corrosion resistance**—This corrosion resistance chart lists over 150 chemicals and their recommended usage with various metals. OPW-Jordan Corp.

Circle 331 on Reader Service Card

**Magnetic pulleys**—Folder describes a line of permanent magnetic pulleys. Eriez Mfg. Co.

Circle 332 on Reader Service Card

**Nuts**—All basic engineering data and specifications on this company's nuts in a condensed catalogue. National Machine Products Co.

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**Hi-pot testing**—Application bulletin gives some practical considerations for setting up both ac and dc high voltage test stations. Associated Research Inc.

Circle 334 on Reader Service Card

**Gold plating**—Paper describes metallurgical properties, operational data and uses of an acid-type industrial gold electroplating process. Sel-Rex Corp.

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Seal For  
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**TYPE 20**

**shaft seal**

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## Briefs

### We note with interest . . .

Engineer at the British Broadcasting Corporation has patented an invention that gives advance warning of swarming bees. Designed for apiarists, of course, but it sounds like a good thing to take on a picnic . . . The Commonwealth "round-the-world" telephone cable system is to get another link. A cable is to be laid across the Pacific between Canada

and New Zealand . . . One thing that executives can do better than anybody, says the sage, is read their own handwriting. And that goes for doctors, dentists and editors — and a goodly number of engineers, too . . . Recently completed in England was the world's largest electrolytic. Engineer in charge of construction made it his last job before retirement. He's 80 years old . . . We reprint the following headline, without comment — Sewage Expert Becomes Editor . . . There's a new method of increasing the range of a spectrophotometer . . . We're told that for finely aged and flavored

beer or whisky, the wooden barrel is still tops for storage. And the best piece of wood in the whole barrel is the spigot . . .

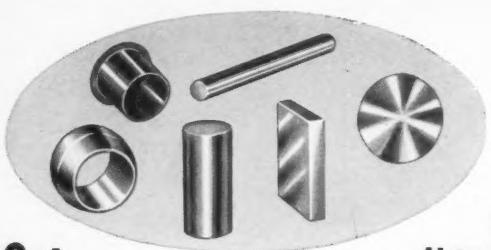
**Business man** in Southern Rhodesia claims relief from crippling pains in his feet while wearing two copper plates under his feet and two under his ankles. Could be because he couldn't even stand. But along comes the Federal Prime Minister and orders copper bangles to cure his rheumatism. Is copper curative? Britain's Copper Development Association have issued a declaration of neutrality . . .

Almost ready for opening is the Oneida Lake Bridge in New York State. Span is 320 ft, construction is prestressed concrete. Total cost: almost \$1 million . . .

**Menu** in a Chinese restaurant lists this dish: "Moo Goo Gai Pan like mother used to make". In case you, or your mother, are interested it's a chicken and mushroom dish . . . Here's a report of a curious experiment: "He photographed the growth of a pumpkin under a skylight in the basement, and showed that either all-male or all-female flowers resulted, depending on the type of fluorescent light used" . . . A new system for viewing televised images transmitted automatically and inexpensively over ordinary telephone wires has been developed. It's called Telecrtovision . . . How's this for measurement: Sheffield Corp. laboratory calibrated three master setting rings (.43840, mean, .43842, max, and .43838, min) to an accuracy of  $\pm$  three millionths. National Bureau of Standards made exactly the same measurement . . . Hanging from a sky hook" may soon no longer be a joke. Some engineers are talking about flying cranes (not the birds) using helicopters . . . Ontario's Minister of Highways has just published this year's estimates for his department, but there is no room in this department for it. The . . . thing is forty pages long

. . . The civil engineering research laboratory at Cornell University has compiled information on modern steel reinforcing bars . . . Sales of Canadian Westinghouse products in 1959 slipped four percent from the previous year with a total of only \$134,303,663. At the same time profits dropped 19 percent . . . Work is under way on a 120,000 hp hydro plant near Hamilton Falls, Labrador. Completion is expected in the summer of 1962 . . . A signal pistol, that shoots red, green or white signals is so light — one ounce — that the manufacturers are recommending that everyone carry one in case of distress. When you are overdrawn at the bank, for instance? . . . A British firm has devised a method of domestic electrical heating that uses no metallic element . . . Soon to be submitted to the government is the long awaited report of the Iisley Royal Commission on Pa-

(Continued on page 71)



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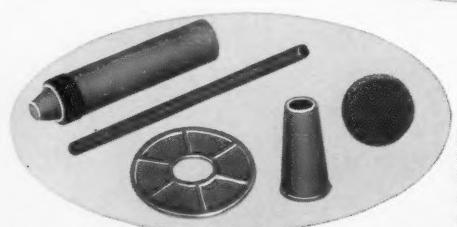


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In your production or purchases you may be using, or planning to use, parts which could be re-designed to your advantage—by reducing price, weight, or number of parts; or by increasing durability and strength.

A newly-developed Design Consulting Service by CSF will bring you a rapid and

technically-accurate reply on how CSF can help you achieve any or all of these objectives.

To find out how this Service can work to your advantage, please fill in the Questionnaire below and mail to our Chief Design Engineer.



## **DESIGN CONSULTING SERVICE QUESTIONNAIRE**

- 1. Service application of part.....
- 2. Loads or stresses, if applicable.....
- 3. Current or intended method of manufacture.....
- 4. Material specifications.....
- 5. Manufacturing tolerances.....
- 6. Finished weight of part.....
- 7. Finish required.....
- 8. What quantities of this part do you or would you normally fabricate or order?.....
- 9. Please attach drawing or sketch of part, along with assembly drawing.

Name of your Company.....

Address.....

Type of business or products.....

Name of individual making enquiry.....

Position within your Company.....



## **CANADIAN STEEL FOUNDRIES LIMITED**

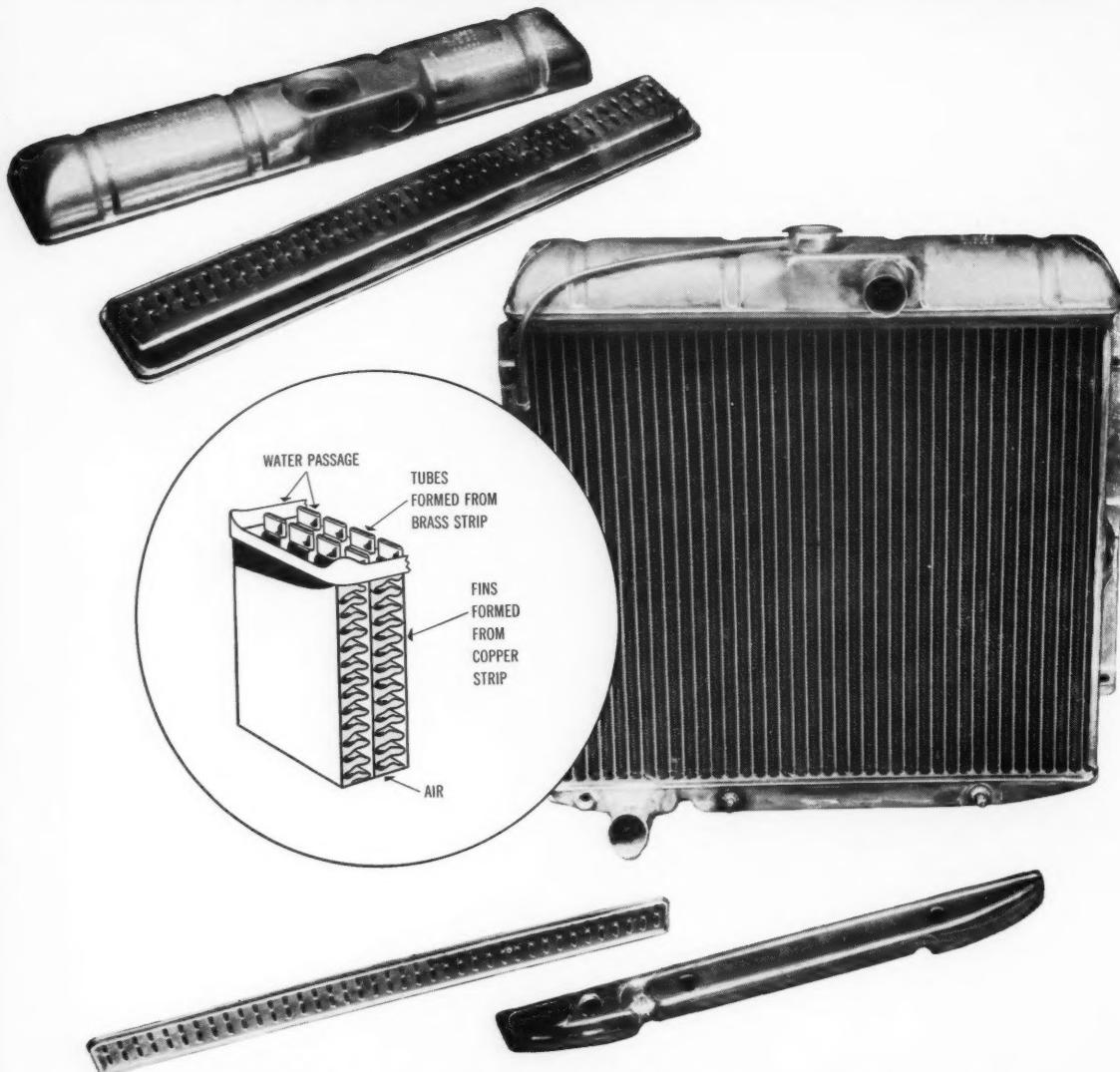
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## Briefs — *continued*

tents. Report was six years in the making . . . **Those Russians** have done it again. Now they've developed "3D" television. Next thing we'll have a three dimensional view of the other side of the moon . . . **Think of ice** as a metal that melts at about 32F and has a tensile strength of 200 psi. By adding a small amount of glass fibre scientists have raised that strength to some 2,000 psi. All they have to do now is raise the melting point and some one will make an awful lot of money . . . **Unfair to birds:** Cloquet Forest Research centre is equipping six male grouse with one ounce battery operated transmitters that will send signals to monitors at the centre. Idea is to find out how the grouse spends his spare time. As if it were anybody's business . . . **Central vacuum** cleaning is here. The lady of the house plugs into an outlet in the room and away goes the dirt into the basement . . . **Coming soon** to the industrial coatings field: water thinned enamels . . . **Experiments** now being conducted may mean salvation to Canada's hard pressed uranium industry. Researchers are looking at uranium as an alloy of steel to produce fatigue-resistant metals . . . **Bamboo towers** for television aerials

are now on the market. Big feature: they bend and can withstand winds up to 100 mph. Big question: can they bring in Peking? . . . **Two U. S.** engineers have come up with a plan to build an underground freight canal from Lake Erie to the Ohio River. Hope they have as much money as imagination. Estimated cost is \$200 million . . . **Experiments** are being conducted in Alberta with precast concrete pipe with the idea of using it in highway culverts . . . **An aircraft** development engineer has turned his talents to tables. He's designed a guitar shaped dining table that is suspended from the ceiling by slender rods. Presumably the idea is to help revellers slide under the table easily . . . **New market** for asbestos is in sight with experiments to use it in paving asphalt . . . **Tire valve** cap has correct pressure printed on its top. Now you won't have to rack your brains when the service station attendant wants to check your tires . . . **Fully automatic** riveting machine punches four holes, inserts and seats rivets in one operation, every six seconds . . . **A Sudbury**, Ontario mining engineer wants to reverse the flow of some rivers. Says that valuable hydro power could be developed in the right places. And he actually figures he can do it . . . **Ten Canadair** engineers are taking training in skindiving. Their company is to test plane fuselages in a 140

ft tank . . . **The Saturn** rocket — the one the Americans hope to send a man into space with — has had a successful ground test . . . **Design Engineering** Show (New York, May 23) is valued at \$10 million . . . **Toronto's** 50 new buses that caused such a stir because of their width, are now stirring up trouble because they are so dirty. Seems the trouble is aerodynamics. They just draw the dirt to themselves . . . **Store** in Ladner, B.C., has been sprayed with a protective vinyl-based plastic . . . **Company** in the U. S. sees a solar-powered car as being quite practical, even for city use. Cost is figured at about \$5,000 . . . **A precision** casting company is to go into production in a new plant in Brampton, Ontario . . . **Prefabricated service** station in Repentigny, Quebec, opened for business only 48 hours after construction started . . . **Biggest stripping shovel** ever is now being built for a coal mine. Capacity is 115 cubic yards . . . **Surveyors** can now make baseline measurements by timing radio waves . . . **Brief talepiece** — Here's a letter received by an aero engine company recently. As you may be able to guess it was written by a rather ambitious schoolboy — "Would you please send me a sample of a turbojet engine . . . or some pictures. I am taking it at school, so that's why I want it." ★

The advertisement features a large central image of expanded metal mesh panels stacked vertically. To the left, there are two smaller illustrations: a tall, narrow vertical panel and a horizontal rectangular panel. Below these, a smaller image shows a wire mesh cage. Text on the right side reads: "Your choice of metals ALUMINUM STAINLESS STEEL COPPER". A Pedlar logo shield is at the bottom right.

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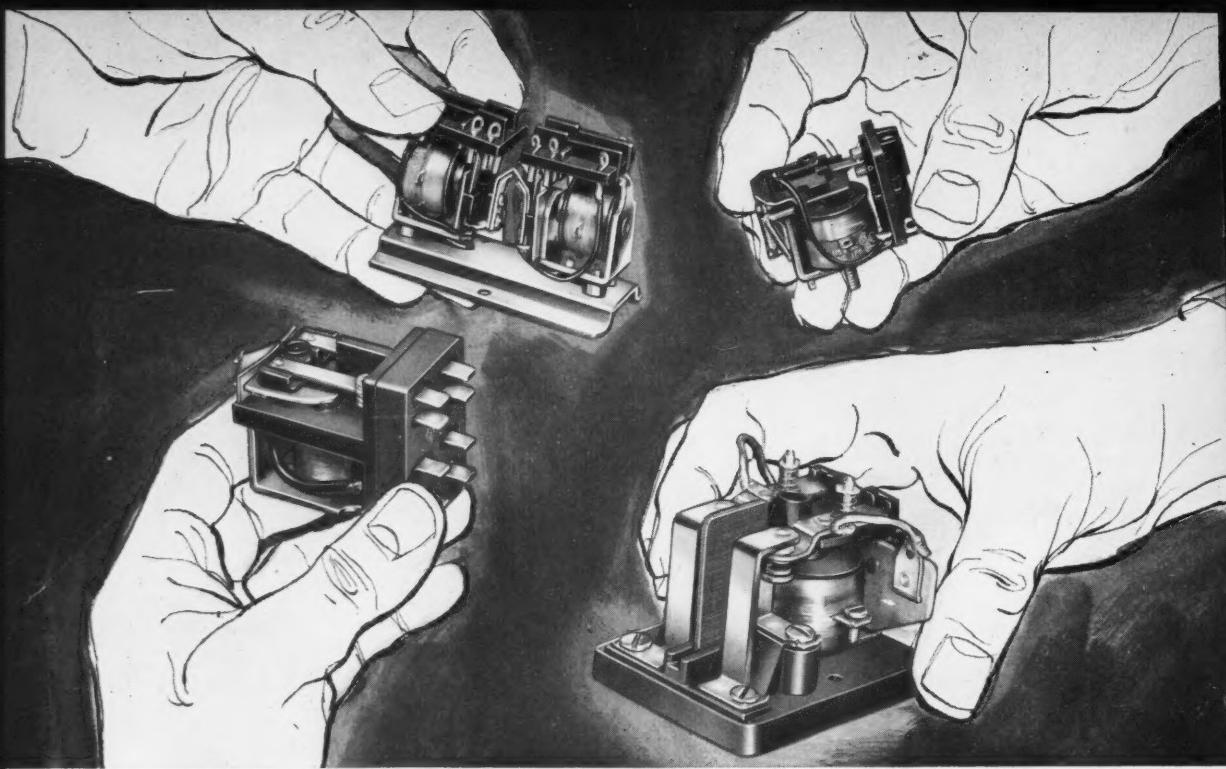
## PEDLAR Expanded Metal Mesh

*offers new design freedom . . . for  
a thousand and one uses!*

Easy to handle . . . light and airy in appearance . . . amazingly strong, Pedlar Expanded Metal gives designers and builders a free hand to produce quick, sound and economical results. Grilles, ventilators, guards, partitions, fencing, furniture, baskets, ceilings, decorative installations, displays . . . you name it and chances are Pedlar Expanded Metal will do the job. You have a choice of many designs and metals, in regular or flattened form, with a variety of gauges and mesh openings.

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Your nearby Pedlar representative is fully trained to discuss the many uses and benefits of Expanded Metal. Call him today. Or write,



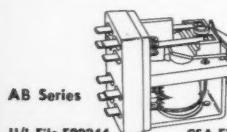
## save time! save money! call your parts distributor for **P&B** RELAYS

These important savings are yours when you order—from your Electronic Parts Distributor—P&B relays listed with Underwriters' Laboratories, Inc. and Canadian Standards Association:

**SAVE TIME.** You get fast, off-the-shelf delivery. Usually your order is shipped the day after it is received. And no waiting for U/L or CSA clearance . . . this has been done for you. Thus you get your project—and your product—off to a fast start!

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More than 40 different standard P&B relays in 450 different coil voltages and contact arrangements are available from the leading Electronic Part Distributors in your area. For special applications, call your nearest P&B sales engineer.



AB Series

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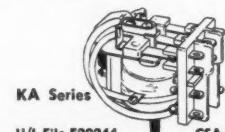
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ABC Series

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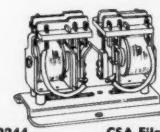
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KA Series

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CSA File 15734



KB Series

U/L File E29244

CSA File 15734

For appliance and general purpose operations requiring long life and quiet operation. Quick connect terminals. Screw terminal adapters also furnished with each relay. Contact arrangement: DPDT. Rated at 10 amps, 115 V., 5 amps, 230 AC non-inductive by U/L and CSA. 5 amps, 230 AC non-inductive by U/L and CSA.

Medium duty power relay in dust cover. For small motors, industrial controls and similar applications. Contact arrangement: DPDT. Rated at 10 amps, 115 V., 5 amps, 230 AC non-inductive by U/L and CSA.

Small, low cost, general purpose relay for handling automation work, small motors, solenoids, other relays. Contact arrangements: SPDT, DPDT and 3PDT. Rated at 5 amps, 115 V., AC non-inductive by U/L and CSA.

| Type  | Contact Arrangement* | Type   | Contact Arrangement* |
|-------|----------------------|--------|----------------------|
| PRIAY | SPST-NO              | PR5AY  | SPDT                 |
| PR3AY | SPDT-NO-DM           | PR7AY  | DPDT                 |
|       |                      | PR11AY | DPST-NO              |
|       |                      |        | DPDT                 |

These relays are available in any of the following operating voltages: 6, 12, 24, 115, 230 volts 50/60 cycles AC. Contacts are rated at: 25 amps, 115/230 V. AC 1 phase. 1 hp for 115/230 volt AC motors 1 phase.

\*Read: NO normally open, NC normally closed, DB double break, DM double make.

U/L File E22245

CSA File 15734

# POTTER & BRUMFIELD CANADA LTD.

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Pearson & Carson Co., Ltd., 10238 103rd St.  
Taylor, Pearson & Carson Ltd., 10215 103rd St.

### BRITISH COLUMBIA

**NANAIMO** Ellison Queale Radio Supply

**VANCOUVER** Robinson Electric Co. Ltd., 1179 Homer St.  
Taylor, Pearson & Carson Ltd., 1006 Richards St.  
L. A. Varah St., 1451 Hornby St.  
Western Agencies Ltd., 951 Seymour St.

**VICTORIA** Ellison Queale Radio Supply, 900 View St.

### MANITOBA

**WINNIPEG** Can Gard Supply Ltd., 397 William Ave.  
Del's Electric Motor Supply, 54 Princess St.  
Electrical Supplies Limited  
Lee Bern & Company Ltd., 341 William Ave.  
United Refrigeration Parts, 223 Garry St.

### NOVA SCOTIA

**HALIFAX** Consolidated Supply Company Ltd.

### ONTARIO

**CHATHAM** Poole Electronic Supplies Ltd.  
161 Richmond Street

**DOWNSVIEW** Alpha Aracan Radio Co. Ltd.  
555 Wilson Avenue

**MONTREAL** Inter-Comm Supply Company Ltd.  
1315 Victoria Avenue

**HAMILTON** The Crawford Radio, 119 John St. N.  
Western Radio Supply Co. Ltd.  
182 Rebecca Street, (at Ferguson)

**KITCHENER** MacDonald Electric Limited  
307 Queen Street, S.

**LONDON** Fisher Radio Company Ltd., 649 Colborne St.  
Poole Electronic Supplies Ltd., 649 Colborne Street

**NORTH BAY** Johnson Electric Supply Ltd.  
13 McIntrye Street, E.

**OSHAWA** H. W. Gourley Ltd., 222 Bond Street, W.

**OTTAWA** Wackid Radio Television Laboratories Ltd.  
149 Gloucester Street

**PORT ARTHUR** Inter-Comm Supply Company Ltd.  
211 Pearl Street

**ST. CATHARINES** Niagara Vallance, Brown  
23 Perilla Street

**SARNIA** Poole Electronic Supplies Ltd.  
24 Maxwell Street

**SUDSBURY** Edwards Sudsbury Ltd., 69 Elm Street, W.  
Sonic Northern Ltd., 300 Elm Street, E.

**TORONTO** Canadian Electrical Supply Co. Ltd.  
877 Yonge Street

Electro Trade Supply Co. Ltd., 563 Yonge St.  
Wholesale Radio & Electronics Ltd., 66 Orlus Road

38-42 Shepherd Street, E.

Poole Electronic Supplies Ltd., 60 Wyandotte Street, E.

### QUEBEC

**MONTREAL** Atlas Wholesale Radio Inc.

4985 Boulahan St.,  
Payette Radio Ltd., 730 St. James St. W.

**QUEBEC** Crobel Ltd., 790 Boulevard Charest East

### SASKATCHEWAN

**REGINA** Radio Supply & Service Ltd., 1965 McIntrye St.

**SASKATOON** Radio Supply Company Ltd.  
56 2nd Ave. N.

### P&B REPRESENTATIVES

Aeromotive Engineering Products Ltd.,  
147 Hymus Blvd., POINTE CLAIRE, Montreal, P.Q.

A.T.R. Armstrong Ltd., 700 Weston Road,  
TORONTO 9, Ontario

Chas. L. Thompson Ltd., 1440 Erin Street,  
WINNIPEG, Manitoba

Chas. L. Thompson Ltd., 3115 Lonsdale Avenue  
NORTH VANCOUVER, B.C.

### POTTER & BRUMFIELD CANADA, LTD.

GUELPH, ONTARIO

## New products

### Adhesive for foam

An adhesive has been developed for bonding flexible foam materials to themselves or to other porous fabrics. Manufacturer is **Dominion Rubber Co., Ltd.**

The adhesive, called Foam Bond, is a solvent based neoprene rubber that has low viscosity for easy application but does not penetrate deeply. It has high wet strength, dries tack free, gives a soft seam and does not stain on ageing or exposure to sunlight, the maker claims. Average coverage is 200 sq ft per Imperial gallon.

Circle 336 on Reader Service Card



### Revolute machine

A new revolute continuous reducing printer and processor for miniature reproduction of engineering drawings has been introduced by **Charles Brunning Co., (Canada) Ltd.**

Reduced size transparencies are made directly from original drawings. These are then available for reproduction at any time and without loss of detail clarity. They can be made as positives or negatives, right or reverse reading, on paper or film. Original drawings may be any length and up to 42 in. wide.

Circle 337 on Reader Service Card

### Work holders and clamps

A line of work holders and clamps for short run welding, soldering and brazing has been introduced by **Strippit Tool & Machine Co.**

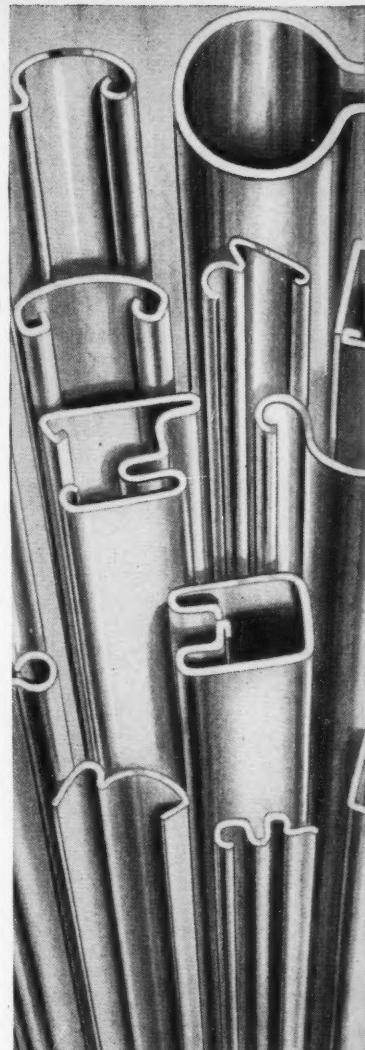
Frames of the holders are made of aluminum alloy. The line includes the following:

Adjustable holders with clamping faces that can be set at any angle from 0 to 180 deg by means of a calibrated dial and a single locking handle.

Straight type with clamp faces aligned for butt joints. Two of these can be locked together for making T-joints.

Circle 338 on Reader Service Card

(Continued on page 80)



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*Completely*  
CANADIAN MADE

### PANEL MEASURING INSTRUMENTS

### PORABLE AND LABORATORY INSTRUMENTS

### ELECTRONIC INSTRUMENTATION

Only a complete Canadian instrumentation facility can offer the kind of service Canadians need. Bach-Simpson Ltd. is complete — in research, design, tooling and manufacture.

If our standard line of instruments, complete as it is, won't meet your requirements, ask us to demonstrate the unique combination of skills we can offer in the design of specialized instrumentation to meet your specific problem.

*Others have, and have been completely satisfied!*

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LIMITED

JA 5187

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## People in the news

New promotion at Aviation Electric Ltd. is that of **George Knapp**. He becomes assistant sales manager of the industrial division. New addition to the same division is **Frank Mark**, previously division manager with Davis Automatic Controls.



Knapp



Berlyn



Christie



Holmes

Engineering services at Dominion Engineering Co., Ltd., has a new manager. He is **Martin Berlyn**, who first joined the company in 1929. He left in 1939 on joining the RCAF. Later he worked in the U.S. but rejoined Dominion in 1955.

★ ★ ★

Promotion for **D. R. Christie** of the Ontario Research Foundation. He becomes director of Industrial Research Services after having been assistant to the previous director. Christie is an honors graduate, in chemistry, of Western University where he also took a master's degree.

★ ★ ★

There are three appointments in the newly formed Walworth Valve division of Canada Iron Foundries Ltd. **J. Holmes** becomes sales manager for the division; **W. MacLellan** is Eastern Canada representative; **M. Campbell** represents the division in Western Canada.

★ ★ ★

**James K. Hossack**, vice-president and manager of sales and service for Ferro Enamels (Canada) Ltd., will travel to England to take up his new appointment as general manager of the parent company, Ferro Enamels Ltd. New manager of sales and service in Canada is **Ronald F. McAllister**. Also announced is the appointment of **Rodger L. Shand** as technical manager of the company's Frit division.

★ ★ ★

Two bright student-teachers, both graduates of the University of Toronto, divide a \$1,500 award from Cyanamid of Canada Ltd. They are **Peter Sidorchuk** and **Irwin Talesnick**. Award is made for outstanding abilities in the fields of engineering, physics and mathematics. The prize will help them in their studies to become professors.

★ ★ ★

**G. Boyd Chesney** has been appointed advertising manager of General Motors Diesel Ltd. He joined the company in 1953 after graduating from University of Western Ontario.

★ ★ ★

As Veeder-Root of Canada Ltd., move their headquarters from Montreal to Toronto **Daniel J. MacDonald** becomes the new manager. He previously was the company's sales representative in Quebec.

★ ★ ★

Canadian General Electric have a new plastics specialist in southwestern Ontario. He is **J. A. Macpherson**. He will make his headquarters in London.

★ ★ ★

Omark Industries Ltd., have made four new appointments. They are: **Russell C. Pryor** who becomes quality control engineer; **Robert J. Seyler**, engineering supervisor; **Dr. Roman Osadchuk**, staff metallurgist and **Frank Breakpear** who becomes product manager of the company's stud welding system.

★ ★ ★

**N. W. Taylor** of the Linde Co., Division of Union Carbide Canada Ltd., has been named assistant to the company's president. He is a graduate of Toronto University and a member of the Engineers Club of Montreal.

★ ★ ★

A former air vice-marshal, **Ralph E. McBurney**, has been appointed head of the technical information service of the National Research Council.

★ ★ ★

Canadian-born engineer **Fred W. Argue** has been elected president of Stone & Webster Engineering Corp.



Left to right: Prof. W. Bruce Maclean, Sidorchuk, Talesnick.

# NEW

THE COMPACT CONTROLLER



BACH-SIMPSON

## Controller-Indicators

offer sampling of pointer position at regular intervals, with positive contacting in the case of a shift of the measured quantity outside of preset limits. Contact pressure is produced by a solenoid, and is therefore independent of meter torque. Circuits of the integral primary relays are actually closed by heavy motor-driven contacts, rather than by the pointer contact itself.

Frequency, voltage, current, temperature — in fact, any quantity which can be indicated on a switchboard instrument — can be accurately and reliably limited or programmed, with simultaneous indication. A variety of sampling intervals and a wide range of contact arrangements are available, and slave units, as well as self-contained types for independent operation, are standard.

In addition, a full line of switchboard meters, compatibly styled and featuring the anti-parallax pointer and scale combination employed in the Controller-Indicators, makes possible a completely integrated panel design.



The Bach-Simpson Frequency Controller-Indicator received the I.R.E. Award for the most outstanding new Canadian component exhibited at the 1959 I.R.E. Canadian Convention.



1255 BRYDGES STREET - LONDON, ONTARIO

JAS260

For further information mark No. 107 on Readers' Service Card

# Nylon parts: machine or mold?

**Volume and part design are the two main factors in this choice**

When nylon is chosen as a design material for small parts, several important variables must be weighed carefully to determine the most economical method of production. The most important variable is volume—total production of a given design. Next in importance is actual design of the part—complex or simple. Other variables may also be important, such as size, finish, and delivery. But in general, the two main factors of volume and design dictate how to produce the product most economically.

The two most common methods of producing nylon parts are by injection molding and machining extruded mill shapes. Injection molding, of course, utilizes nylon resins in bulk form which are heated to liquification and forced into the cavities of a mold. Machining refers to the conventional techniques of turning, milling, drilling, tapping, reaming, blanking, and punching. To produce a nylon part by machining involves one or more of these operations using either standard extruded shapes such as rod, tube and sheet or special nylon shapes and profiles processed through an extrusion die.

### Effect of volume

The cost of setting-up for production affects the choice of a production method. This cost is evaluated mainly on the basis of volume (Fig. 2). For example, a new multiple-cavity mold may cost up to \$2,500 depending on the number of cavities and the complexity of the mold. Consequently, a minimum production run is required to merely break even on the cost of the mold, not counting the costs of material and production. This factor makes injection molding impractical for short runs or prototype designs.

Tools for machining nylon extruded mill shapes, however, generally involve little in the way of added tool cost with the exception of blanking dies which may range from \$50 to \$250. Standard machine shop equipment such as circular saws, automatic screw ma-

chines, turret and production lathes, drill presses, milling machines, and punch presses are flexible enough to fabricate nylon parts using only simple fixtures.

Unless automated tool fixtures are used, however, this is piecework, and labor costs per part are fixed regardless of volume. Machining pays off for short runs where mold cost can't be amortized or where quick delivery is needed.

On the other hand, injection molding provides lower unit costs for long runs. Labor costs are not fixed for each part as in machining, and as volume increases, unit costs go down.

Aside from actual cost of setting-up, injection molding presents another problem that may be important in some cases. While parts may be produced without delay by machining, acquiring a new mold takes time for design and fabrication. This is an important factor if quick delivery is needed and machining operations are competitive.

### Design may dictate

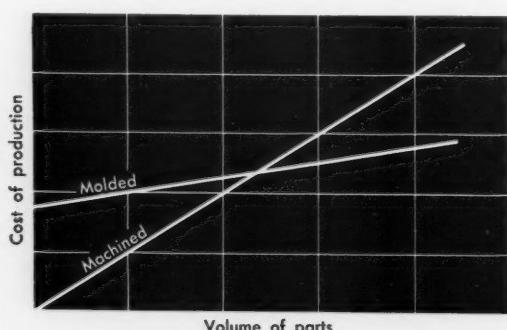
Occasionally, the design of a nylon part actually dictates the method of production regardless of volume. Simple symmetrical parts such as pins, washers, discs and many profile shapes are easily machined from stock extruded mill shapes (Fig. 3). On the other hand, intricately-designed parts and contour shapes are often difficult to machine consistently and should be injection molded (Fig. 4).

In fact, injection molding is the best way to mass-produce non-symmetrical and contoured parts with consistent dimensions and close tolerances. An efficient molding cycle will reproduce the same part time after time automatically. In machining, however, an error can always happen and be compounded by subsequent working.

Threaded parts, multiple undercuts, and "blind" holes are usually machined for the close tolerances required for precision assemblies (Fig. 5). This is because injection molded parts suffer a slight amount of shrinkage after cooling. Even though this shrinkage is slight, it is difficult to predict and may necessitate re-working of the mold.

Some parts simply can't be machined without special equipment. Examples of this are parts having internal recesses with planes and corners and miniature, complex parts. For these parts, injection molding is the only satisfactory method of production.

Parts with varying cross-section are produced with less difficulty by machining. This is because injection molded parts with non-uniform cross section usually experience some warping while cooling.



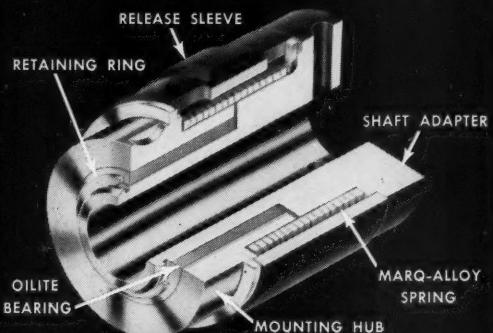
1. Assuming parts can be produced either way, a chart prepared to determine the actual "break even" point.

*Mr. Graesser, author of this article, is chief engineer, National Fibre Co. of Canada, Ltd., Toronto.*

Compact, Dependable

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## On-Off And On-Off Indexing Series



### Series C, On-Off Clutches

These clutches are designed for selectively driving and over-running in the same direction. They can be actuated simply by either mechanical or electrical means.

Available in torque capacities of 8 to 1250 pound-inches, with shaft sizes of  $\frac{1}{8}$  inch to 1 inch.

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The Series D Clutches are for selectively driving and over-running in the same direction, in cases where coasting of the driven member is undesirable.

Available in torque capacities of 8 to 1250 pound-inches, with shaft sizes of  $\frac{1}{8}$  inch to 1 inch.

**Curtiss-Wright Clutches Include:** Over-Running and Backstepping Indexing • On-Off • On-Off Indexing • Industrial Safety-Lock

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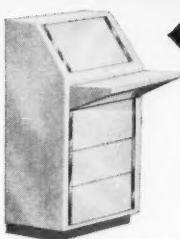
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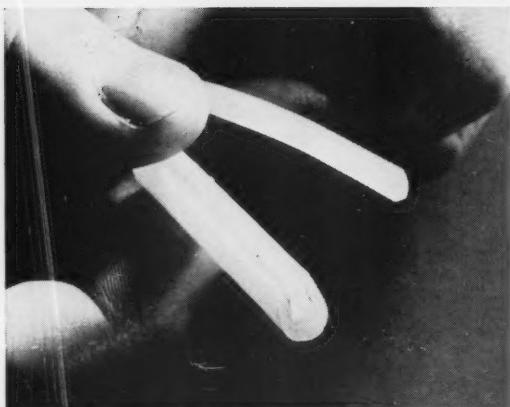
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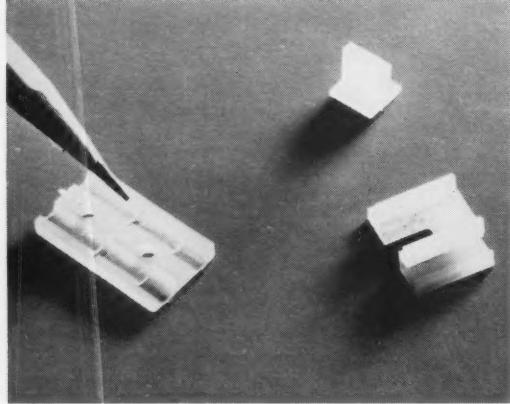
GUELPH, ONTARIO, CANADA

H/17

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2. Special extruded shapes help reduce machining operations to minimum—are adaptable to mass production.



4. Intricate parts, contour shapes are usually molded to eliminate excessive machining. Note internal recesses.

#### Design changes

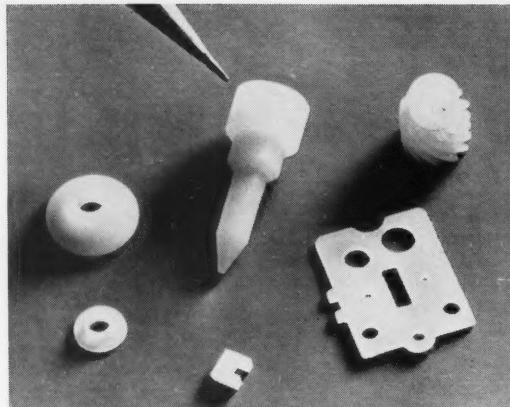
Quite often, the design of a nylon part is subject to a refining process brought on by testing and customer request. This is difficult to control and, unless anticipated, can disastrously affect the profit picture. Usually, nylon parts in a transitional design stage are produced by machining to eliminate the high cost of frequent mold changes.

It's easier to change the setting on an automatic screw machine than to change molds, and far less costly. This is true in the manufacture of a new product or in supplying parts to original equipment manufacturers. Once the design is stabilized and trial orders are accepted, a changeover to injection molding may be clearly indicated.

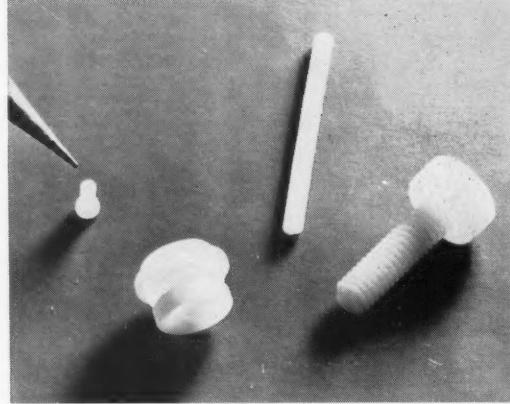
#### Other factors

Size of the part sometimes determines how it will be produced. Some parts may be so large that injection molding equipment just isn't feasible due to floor space requirements for mass production. On the other hand, some parts can only be injection molded because they are too small for machine tool fixtures.

Finish may be a factor. While molded surfaces are nearly perfect, most injection molded parts are ejected



3. Machine simple shapes from stock extrusions. Pin machined from  $\frac{3}{4}$  rod, others from tube and sheet.



5. Machining produces closer tolerances for precision parts and details — molded parts shrink on cooling.

from the molds connected by sprues and runners which must be removed. Depending on the use of the part it may be necessary to completely remove all traces of this excess material. This requires additional labor for buffing and polishing or added equipment such as tumbling barrels.

Machined parts are usually finished to exact dimensions therefore no extra labor or equipment is needed to remove excess material. Toolmarks, however, may require buffing for a satisfactory finish.

#### What About Penton® and Delrin®

Production situations involving the use of Delrin or Penton are approached in the same manner, generally speaking, as nylon. These two new thermoplastic materials are available both in bulk form for injection molding and in standard and special extruded shapes for machining.

Delrin is similar to free-machining brass and can be machined on conventional equipment to fine tolerances. Punched edges are smooth and sharp, threads are true, and tapers can be ground as smooth as brass or zinc. Penton also machines well on conventional equipment. Parts fabricated of Penton can be produced to close tolerances which are not affected by environmental conditions.

Because of the special properties of Penton and Delrin and the relative scarcity of application data, machining is recommended to reduce development costs.

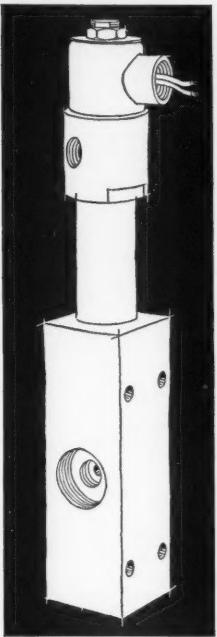
**Delrin®—Du Pont's acetal resin**

**Penton®—Hercules chlorinated polyether resin**



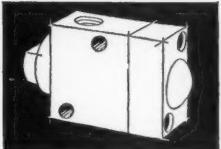
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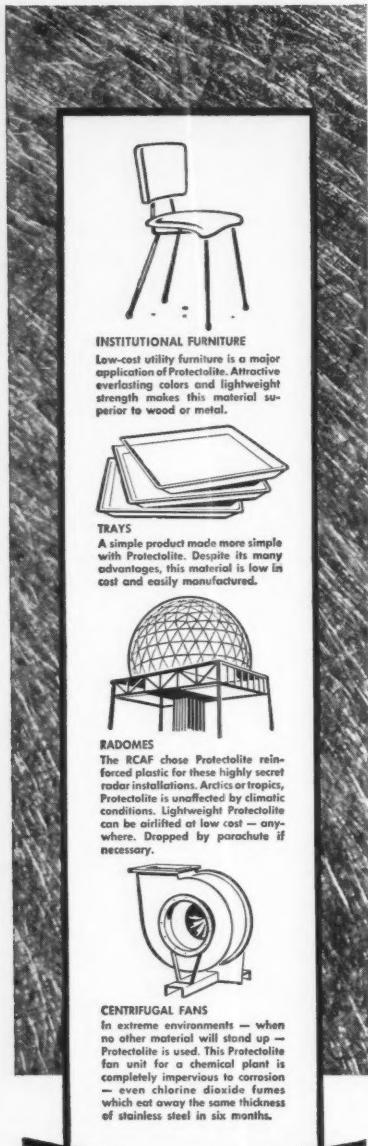


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## New products

### Exhaust solenoid valves

Midget, three way, "quick exhaust" solenoid valves are now available from Davis Automatic Controls Ltd.

An oversized  $\frac{1}{4}$  in. diameter exhaust orifice is an integral part of the body, eliminating the need for connecting a separate quick bleed valve in the circuit. The valves are direct acting type and have brass bar stock bodies with  $\frac{1}{4}$  in. N.P.T. connections. Discs are nylon, providing tight seating on air, gas, water and light hydraulic oil up to 160 psi, depending on the type of operation. Design of the valves is completely packless.

Circle 339 on Reader Service Card

### General purpose valve

A new series of valve, the V-34, in the Hydrex line is now available from Stratoflex Canada Inc.

This is a general purpose valve, employing the sectional principle, designed for use on lift trucks and other mobile equipment where supplementary operations are often added to standard models.

Circle 340 on Reader Service Card

### Selector switches

A new series of rotary selector switch assemblies, featuring a "cock-and-fire" actuating mechanism and nonseal circuitry, has been introduced by Honeywell Controls Ltd.

Designed primarily for use on aircraft, electronic and computer panels the switches are known as the 28AS series. They can be provided with two to eight plastic-enclosed single-pole/double-throw basic switches and two or three actuator positions. Detents are 90 degrees.

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### Hydraulic power unit

A larger capacity model has been added to the line of pre-engineered and packaged hydraulic power units from Double A Products Co.

Reservoir capacity is ten gallons. Mounted upon the tank are the electric motor, of 1,  $1\frac{1}{2}$  or 2 hp, and from one to four solenoid controlled four-way directional control valves. There is no external piping. Reservoir pumps are 1,  $1\frac{1}{2}$  or 3 gpm.

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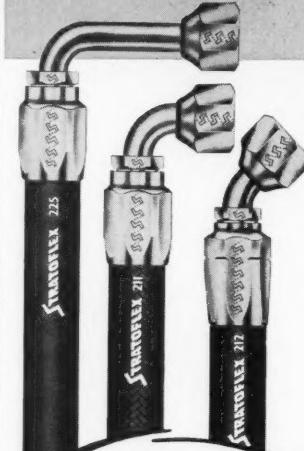
### Self-adhesive nameplates

Aluminum self-adhesive nameplates are a product of GM Aristo-Cals. The nameplates, designed for use for trademarks, instruction plates or schematics can be produced in over 100 color combinations, including gold and silver.

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Installation of hose assemblies in a confined space has long been an industry problem. To solve this problem, Stratoflex has developed a flared tube series of elbow hose fittings and assemblies. Use of these Stratoflex assemblies eliminates the need for combinations of fittings and elbow adapters.

- Form tubing used for fabrication of fittings to allow uniform flow.
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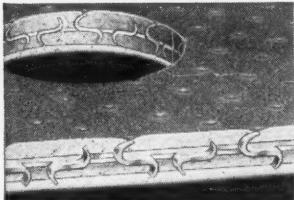
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### Two Types:

Conduit type and grommet type. Port sizes 1/8" and 1/4" N.P.T.

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Standard with 115 V. A. C. but also available in 12, 24, 208, 230, 460 V. A.C.

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Small, but with more strength in the Marsh manner. Coils never overheat. Entire assembly leak tight. Remarkably quiet operation. Cleanable without breaking connections. Used in any position. Bodies either brass bar stock or 18-8 stainless steel. All moving parts stainless. Underwriters' approved for use on oxygen and hydrogen and as safety valves.



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## Ideas round-up

You can give your tubular polyethylene film improved clarity and gloss by using a newly developed, simple annealing chamber. So says a U. S. chemical company and their tests appear to prove it.

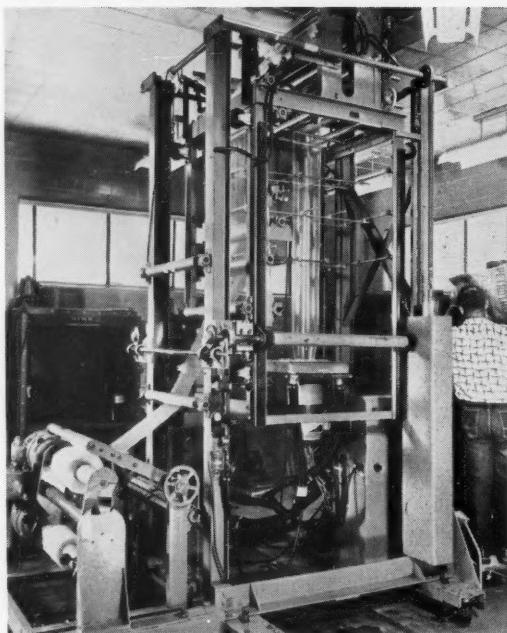
Secret of the improved qualities provided by chamber annealing can be traced to the fact that the film frost line is raised in this technique. Technicians found that height of the annealing chamber is a critical factor in obtaining optimum film properties. Best results were noted when a chamber between 6 and 10 in. high was used. Final recommendation was a hinged chamber 8 in. high with a 4 in. tubular die. The ratio of chamber diameter to die diameter is not so critical but preferably should be held between 2:1 and 3:1. It was noted that the annealing chamber is most effective when extruding resins that have a narrow molecular weight distribution.

Some disadvantages were also discovered, though none were considered serious: There is a slight sacrifice in toughness, though a more balanced tear strength was shown; there is a slight increase in blocking and a reduction in slip, but these factors are controllable by resin compounding; the raised frost line increases the tendency to wrinkle so that closer mechanical control, such as in take-off, must be observed.

The annealing chamber is inexpensive to construct. It can be built of wood, glass or insulated metal. Source — *U. S. Industrial Chemicals Co.*

Circle 344 on Reader Service Card

### Chamber clears up film



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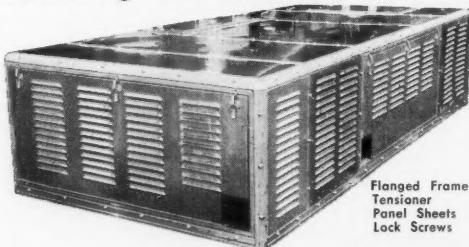
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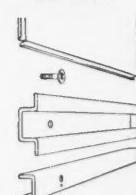
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**PERFORMANCE-ENGINEERED TO YOUR REQUIREMENTS**



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B-49

## Flexonics

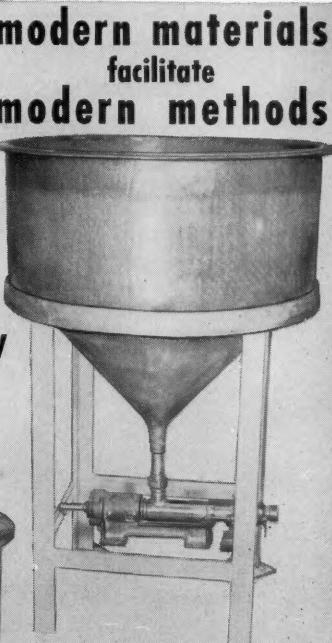
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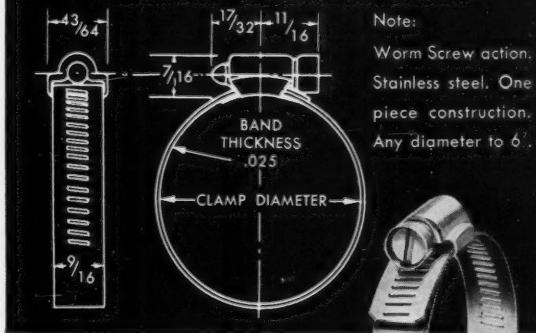
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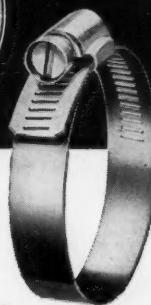
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## Ideas round-up *continued*

### Stud welding saves time

Stud welding is cutting assembly time and improving product appearance for one electrical company. It is using end-welded studs to mount the chassis of constant voltage dc power supplies.

The studs, quickly end-welded to the inner side of the panels, replace the through-bolts with spacers that were originally specified. Because the studs are one-side fasteners, applied with a semi-automatic stud welding gun, no drilling or countersinking of the  $\frac{1}{8}$ -in.-thick panels is necessary, as would have been the case if bolts had been used. Even with countersunk holes, screw heads would have affected appearance.

Two sizes of studs are being used,  $5/16 \times 3$  in. and  $3/8 \times 5$  in. On most of the panel sizes a stud is welded at each of the four corners. After the chassis is in place, nuts are run down on the threaded ends of the studs.

Studs are welded at an average rate of three per minute with a production welding unit mounted on an air cylinder. Panels are located under the gun with a simple jig. For small production runs, or odd-shaped panels that do not fit the jig, a snap switch on the control box permits operation of a hand stud welding gun off the same box. Source — *Gregory Industries Inc.*

*Circle 345 on Reader Service Card*



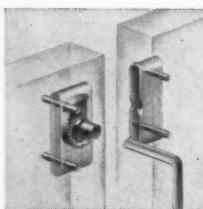
### Q. How can I solve my panel fastening problems?

#### A. Use ROTO-LOCK

ROTO-LOCK fastens demountable panels quickly and securely—at right angles or butt joint. Just turn tapered cam to lock, turn again to unlock.

##### Check these cost-saving advantages:

- Carries both heavy tension and shear loads
- Locks securely even in misaligned or semi-open position
- Used for air and water-tight seals
- Has no springs or delicate parts
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- Recesses completely into panels



Applications include portable shelters, walk-in coolers, scaffolding, demountable furniture, partitions, air freight cold storage shipping containers, etc. Write for 40-page catalog on complete line.

Ask for samples, too.

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Quick-Lock • Spring-Lock • Roto-Lock • Link-Lock • Dual-Lock • Hinge-Lock

### SIMMONS FASTENER CORPORATION

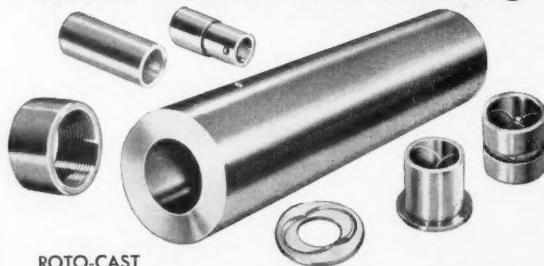
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The high quality castings resulting from the advanced ROTO-CAST process offers Industry a bronze bar as perfect as metal can be—no hard spots, no sand or gas inclusions, no shrinkage cracks—dense, fine-grain structure throughout. Cut scrap loss 15% to 50%—40% to 60% longer wear.

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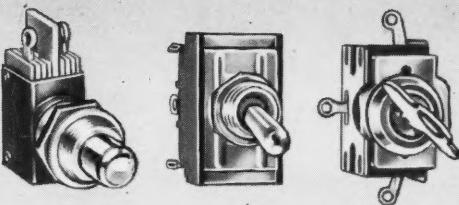
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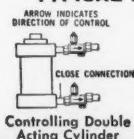
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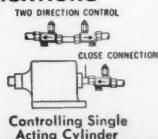
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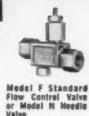
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Valve



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Valve or Model AM  
Needle Valve.

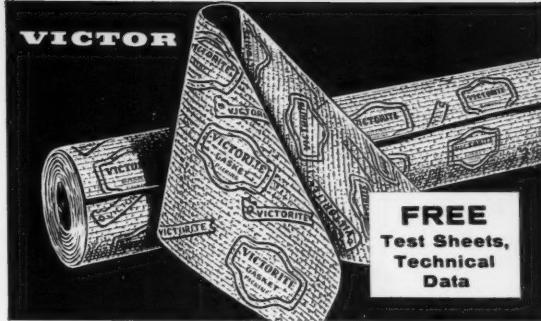


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## **Editorial**

**Be sure to see  
the Design  
Engineering Show  
.... you'll never find  
a better source of  
engineering know-how**



*Editor checks bearings—1959  
at Design Engineering Show*

The Canadian habit of discounting achievements by Canadians is an unrealistic and costly one, in the opinion of Dean Porter of the College of Engineering at the University of Saskatchewan.

He cites as examples of achievements in support of his views inventions by Canadians, television programs, and Canadian technical publications in engineering. He said that after inventions in electronic equipment, for instance, were bypassed by firms in Canada, competitive American companies developed and marketed them. As a result Canada lost the right to the inventions.

Dean Porter noted also that Canadian researchers and designers did not submit manuscripts to Canadian publications because they lacked confidence in them.

We must agree with Dean Porter's view that Canadians lack confidence in their many achievements in many fields. The Dean has rendered an important public service in his outspoken criticism of our countryman's pernicious habit of self-depreciation.

We especially appreciate his words on Canadian publications. His claim has been earned in the case of the seven companies who are exhibiting at the Design Show—but who did not have enough confidence in a Canadian publication to even provide the necessary information to obtain a free listing (see page 56), though they were requested to do so. In fact, they never even had the courtesy to answer our letters.

**Keeping in touch with what is going on in the world** around them is one of the major problems faced by professional men today. The advent of space-age technology, for instance, has opened up entirely new vistas for the design engineer.

Some engineers, however, are content to ignore the accomplishments of their fellow travelers. They hibernate behind closed doors, surrounded only by their own shadows and failures. Their outlook is narrowed; their output, by the same measure, is also narrowed.

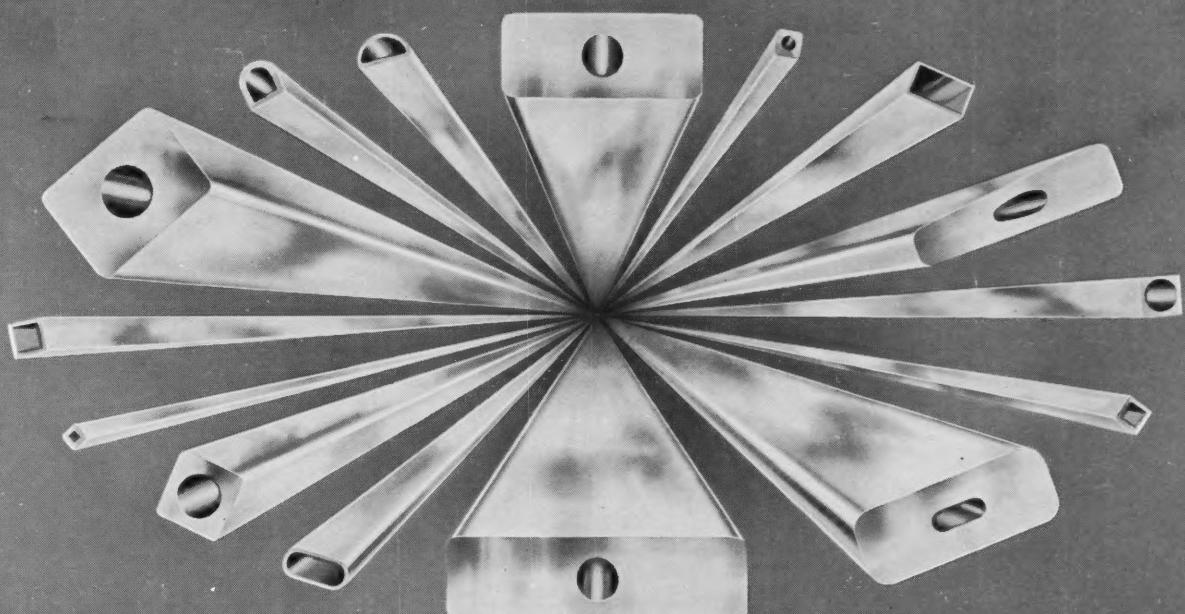
In contrast, other engineers are ever reaching out for that which is new and different. They scan all the related literature; they interview salesmen and application specialists; they review manufacturers' bulletins and broadsides; they even attend meetings of technical societies and business associations. And — they still find time to get things done!

Possibly the most exhilarating event in the development of the design engineer is the annual Design Engineering Show. This show, born in Philadelphia in 1956, returns to the Coliseum in New York this year. Details of the show, and the ASME conference held concurrently, have been previewed in this edition of DE, commencing on page 49. If you haven't already read it, we urge you to turn back the pages and do so.

Better still — we recommend that you attend the show in person. There is still plenty of time to make the necessary arrangements. No matter what field of engineering design you are associated with — from aircraft to zirconium — there will be much for you at the show. And when you get there, be sure to stop at Design Engineering's booth in the Canadian section on the second floor and say "hello." We will be delighted to meet you in person.

Most important of all, be proud to be known as a Canadian. Let everyone at the show know that Canadian engineers take a back seat to none even if we haven't yet put a satellite into orbit or got a power producing nuclear station.

# THE SHAPE OF THINGS TO COME WITH ANACONDA ELECTRICAL COPPER



**Fluid-cooled copper conductors.** The growing need for compact electrical assemblies which can handle high current densities is leading to an ever-increasing variety of hollow, fluid-cooled copper conductors. The samples shown, about three-quarters full size, give some idea of the sizes and shapes which could be manufactured.

**Industrial applications.** The use of fluid-cooled conductors is growing rapidly in large electrical equipment. Generator output can be greatly increased, without increasing frame size, by cooling stator and rotor bars. Fluid-cooled conductors are being used in heat sinks for rectifiers and induction furnace coils.

Another interesting use is in compact water-cooled windings needed to provide very high flux densities in, for example, the ceramic magnet manufacturing process. These "solenooids" are being built for applications in which the current range is from a few hundred to about 2000 amperes.

**Technical assistance.** Whatever your problem—liquid-cooled field coils, rotor bars or a special-shape tubular conductor—we will try to solve it. Consult the Metallurgical Department of Anaconda American Brass Limited, New Toronto (Toronto 14), Ont. Sales Offices: Quebec City, Montreal, Calgary, Vancouver.

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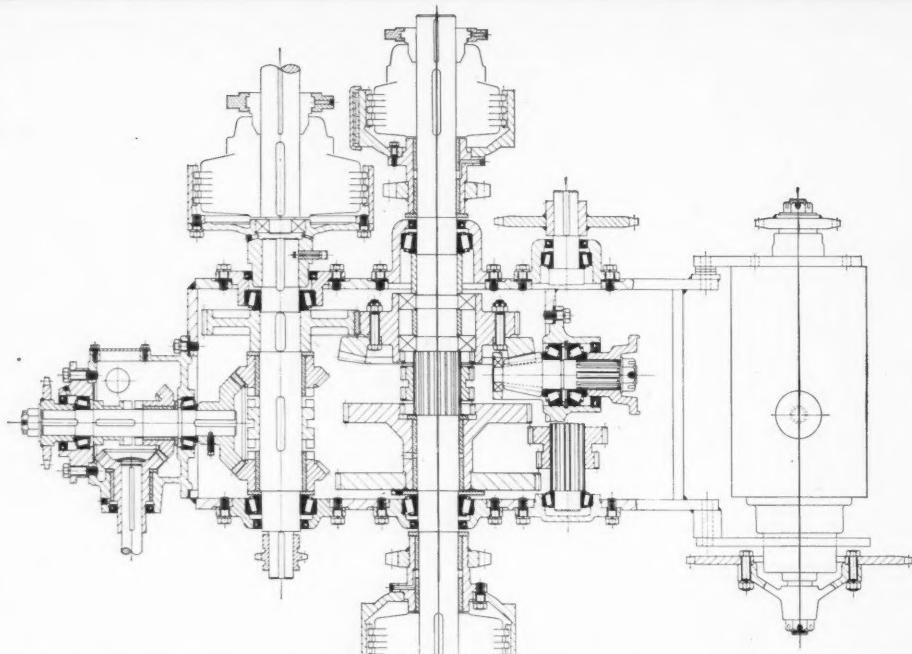
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# How Parsons mounts shafts to take heavy loads, keep Trenchliner digging



Parsons Company engineers used 10 Timken tapered roller bearings to help solve load-carrying problems in their Model 150 Trenchliner. Radial and thrust loads are heavy as the Trenchliner digs fast—25 fpm., digs deep—5'9", digs wide—26". By using Timken bearings in the transmission assembly shown above, their engineers assured positive alignment of gears and shafts under all loads. Digging goes steadily. For more

than 40 years construction equipment engineers have used Timken bearings because: 1) The taper lets Timken bearings take radial and thrust loads in *any* combination. 2) By holding shafts concentric with housings, Timken bearings make closures more effective in keeping lubricant in, dirt out. 3) The extra load carrying ability of Timken bearings takes care of the rugged going and provides longer life.



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